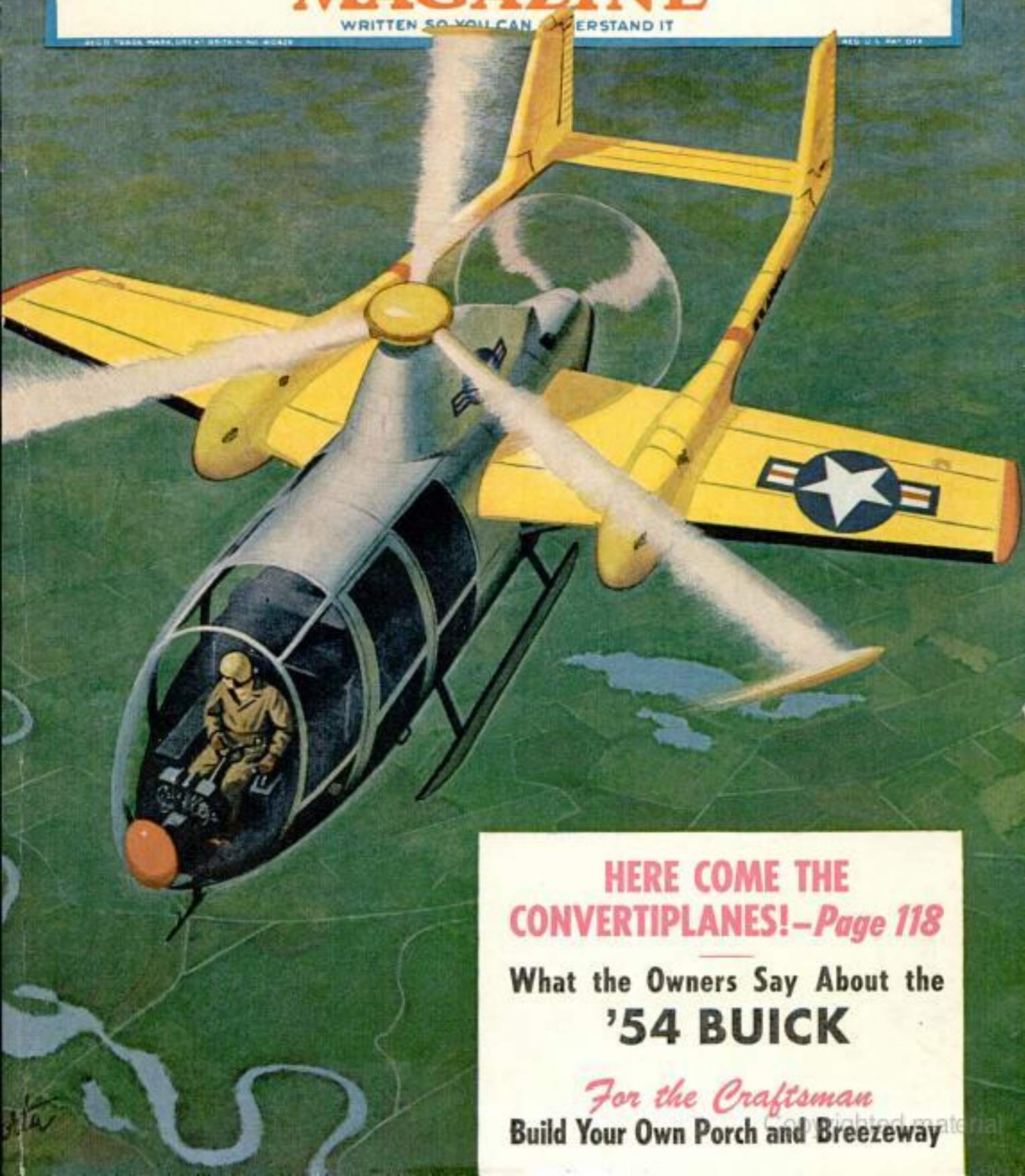


POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT



**HERE COME THE
CONVERTIPLANES!—Page 118**

**What the Owners Say About the
'54 BUICK**

For the Craftsman
Build Your Own Porch and Breezeway

NOW! GO FISHIN' WITH A

Quiet OUTBOARD MOTOR



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5 1/2

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needs
waxing!

I WAS just finishing up the new flooring for the kitchen when the delivery boy arrived with the week-end groceries.

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JUNE 1954

This One



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Volume 101 JUNE 1954 Number 6

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this month's cover

Here's a freak aircraft that may start the world of aviation flying off in a new direction. It's called a "convertiplane" and it combines the vertical lift of the helicopter with the speed of a plane. This aircraft and several similar designs are far from dream stuff, for they're actually under test. For a full report on what may become the airplane of tomorrow, turn to page 118

next month . . .

Every community has its handyman to outsmart the Gremlins, and Statesville, N. C., has Mr. Hamlin. His business is anything. He'll crack safes (legally, of course), fix the kids' bikes or turn out some new cogs for the town clock. Don't miss "Mr. Hamlin Will Fix Anything" coming up in the July issue

Information not listed on articles in the index, starting on page 12, frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge. A copy may be obtained by writing to the Bureau of Information, Popular Mechanics, 200 E. Ontario, Chicago 11, Ill.

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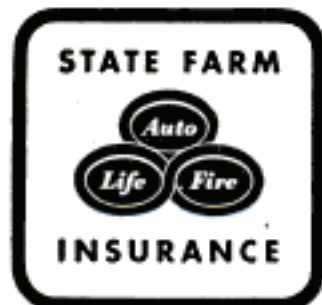
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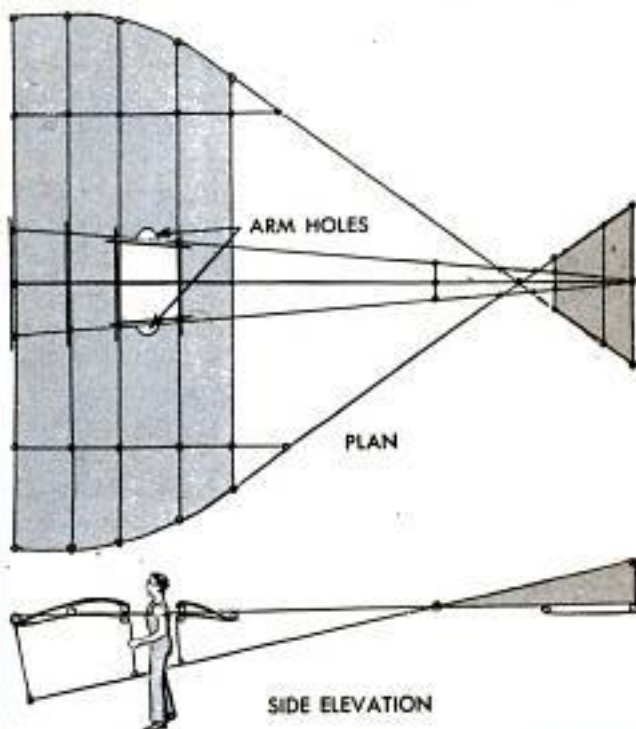
in this corner.....

THE EDITORS



To the Editor:

Reminiscences in the March issue relating to the PM glider of 1909 bring back to memory . . . the craft I constructed with the help of a doting bachelor uncle. (It had) very little in common with the PM plans. Selected straight-grain spruce was beyond the limit of the pin money of a boy, but bamboo poles were cheap as dirt, so bamboo became the framework. Joints were made with fine fishline lashing, then varnished. Linen wing covering presented a problem until the uncle slyly remarked



that mother's guest sheets were of good linen and light in weight . . . Two wings needed; two sheets available; two sheets made one wing, so the craft became a monoplane. From then on the design became my own.

All the spars were placed butt forward except two spars whose flexible tip ends were bent to form curved wing ends. This allowed the wing to curve upward in flight much as the tip of a gull's wing. The heaviest fishpole of the lot acted as a seat in flight, and between the legs when taking off. The wing covering was sewed to the underside of the front and aft spars and on top of the intermediate braces thus making a shallow airfoil. Because of the lightweight materials, the glider weighed only 18 to 20 pounds and with 50 pounds of boy, the wing

(Continued to page 8)



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loading was slightly less than a pound to the square foot.

There were no hills to race down in launching, but there was a long low-roofed cotton warehouse behind which was a sawgrass swamp, and in front a level field. On its first flight it flew as a kite with the aid of 200 or 300 feet of sash rope and a 50-pound sack of sand tied to the spar. It flew beautifully in a moderate wind but in a strong wind the only direction it had was up. I made several glides of half a mile in moderate winds, then becoming bold raced off the roof in a high wind. At least I tried to race off the roof, but the craft became airborne before half the distance down the roof was covered. I went up and backwards! One of the wing-tip spars broke and the glider spiraled into the sawgrass. I was not quite as lacerated as the glider, nor was that all after the sheets were identified.

L. B. Adams,
Birmingham, Ala.

The Steam Car—Again

Mr. Glenn G. Smith, page 8 of March 1954 *Popular Mechanics* is not alone in his sentiments in favor of the steam automobile. Steam accomplished more in its day than did the gasoline cars. The fluid flywheels of the present are a very poor substitute for the control that the steam cars gave us forty years ago. These drives cause the one-direction, internal-combustion engine to wear itself out while waiting for traffic lights to change.

In this atomic age, steam should come into its own, for atomic power is heat and heat makes steam. The steam engine is simple and easy to build and runs much nicer and smoother than the internal-combustion, one-direction fumigator we now have. Incidentally, a steam engine will outlast four or five automobiles.

L. W. Simkin,
Orlando, Fla.

☆☆☆

I was interested in the letter written by Glenn Smith because at Handforth, Cheshire, England, there has been manufactured in the last few years a steam engine specially designed to fit into automobiles. It has three cylinders arranged radially and poppet valves instead of the usual sliding valves. There is a flash-point boiler. The ordinary car radiator condenses about half the steam which is then used again. Installed in a 1938 Buick, this engine burns old engine oil, goes 12 miles per gallon and takes three minutes to warm up. A spark plug lights the burner. The hill-climbing

(Continued to page 10)

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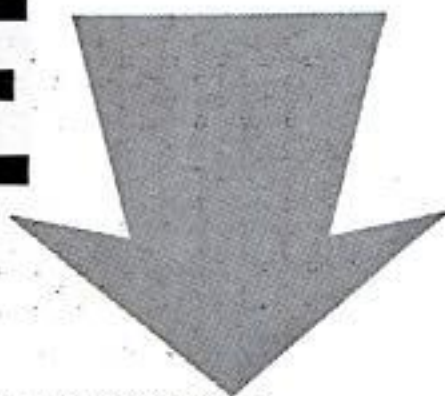
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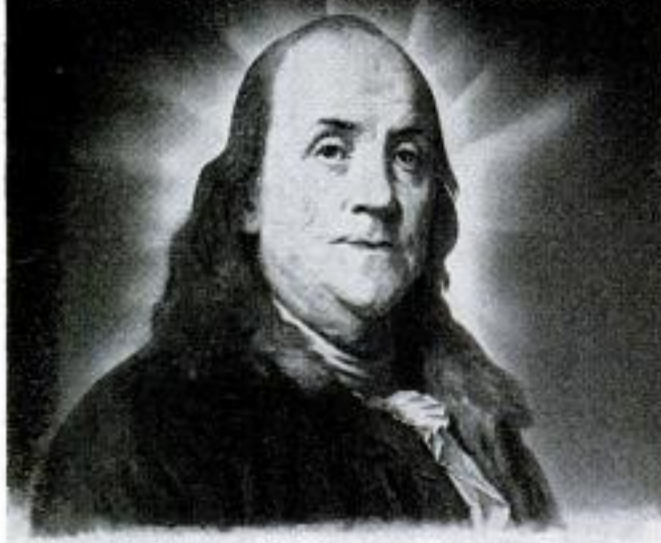
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and silent qualities of the car are quite as attractive as in the standard internal-combustion engine.

L. H. Brooks,
Bromborough, England

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To the Editor:

With great interest I read your article on American Classics (PM, Feb. 1954) and it certainly did stir up some memories.

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I was awed when Fred showed me the huge engine but at the same time it reminded me of something I had seen before.

"That looks like an Amilcar, the French sport-car engine," I said to Fred.

"There it is," he answered, showing me an Amilcar engine lying in the corner. In his Saxo-German accent he readily admitted that his engine was based on the then famous French design.

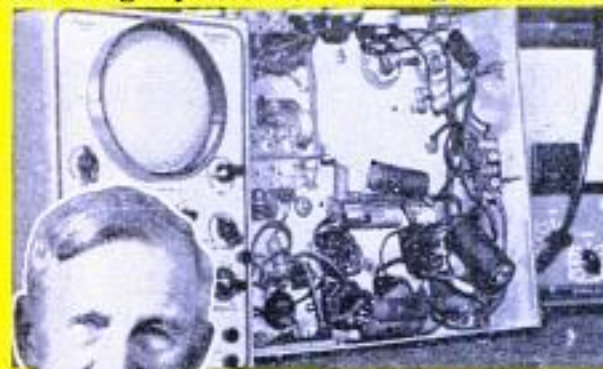
A few minutes later I took the big sedan over the racing track where I gave her the works. She easily reached a clocked 110 miles per hour. She had one trouble, though—the clutch. When starting, one had to ram it into first, for the shaft would not stop. The rest was easy with double clutching. Fred told me he tried to get the Mercedes clutch system for his car, but they would not give him the right to use it. Long after, he still had clutch trouble.

Count Morner of Morlanda,
Stockholm, Sweden

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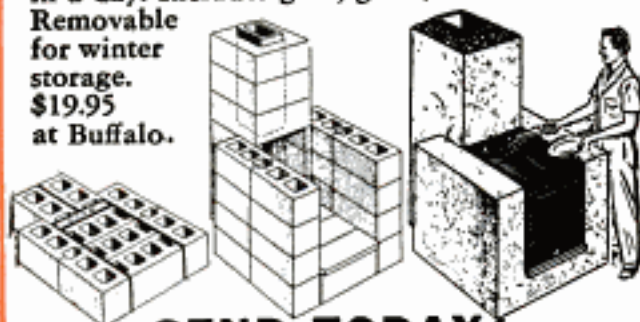
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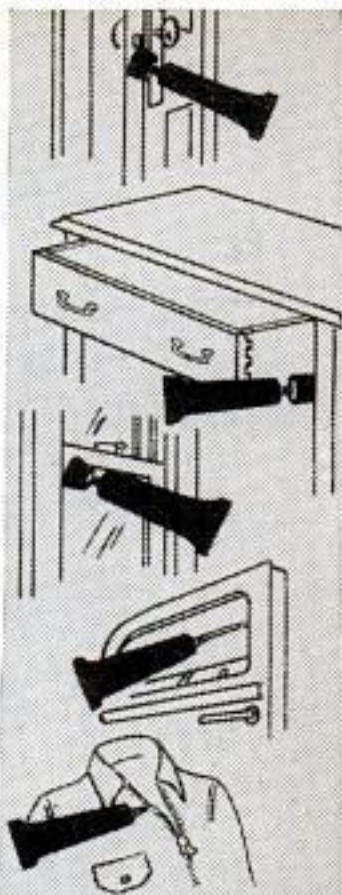
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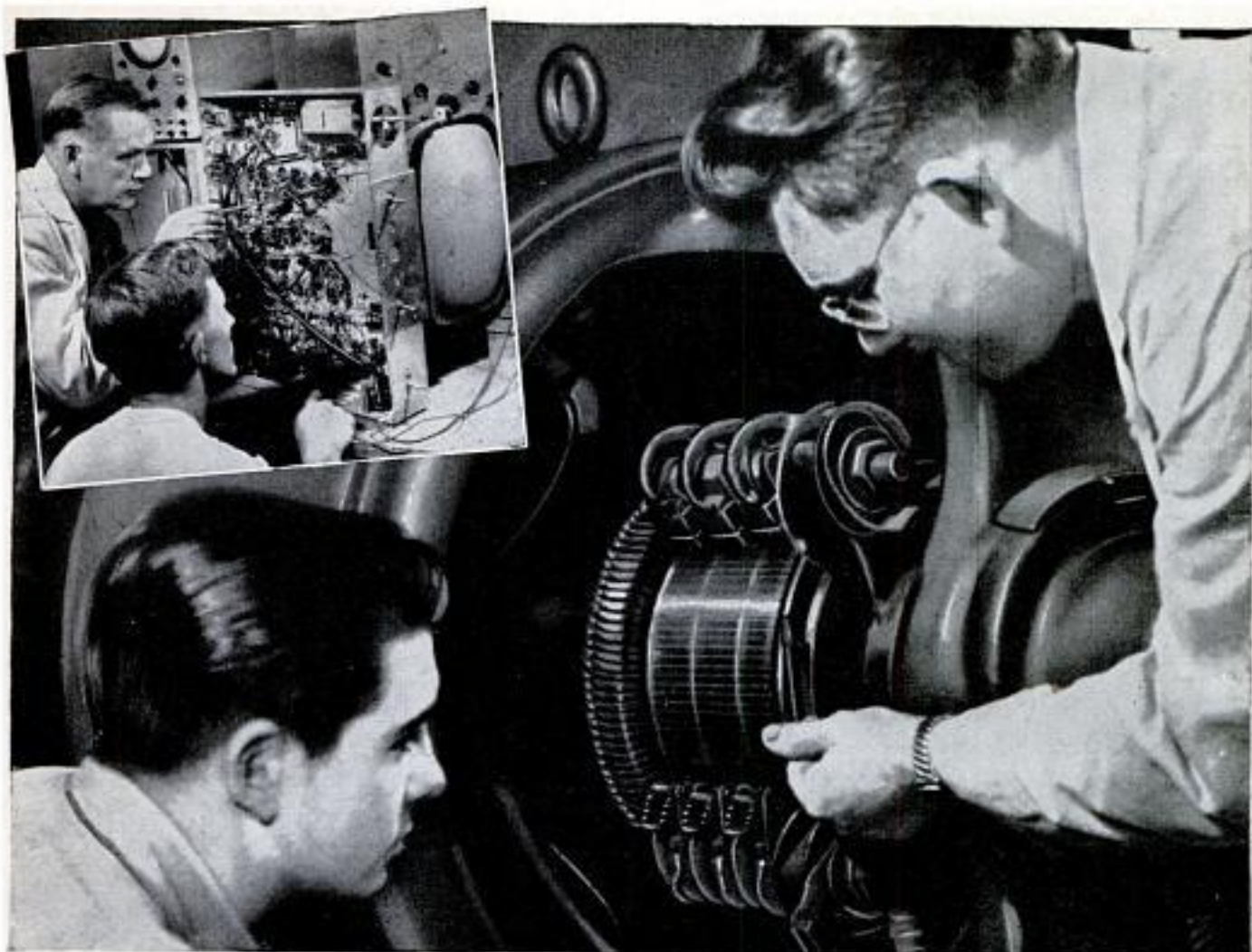
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I don't want any of your money and I don't want you to buy anything. I just want to reveal the simple facts about a business which is putting thousands of salesmen in the high income brackets all over America. Maybe you already know about it and maybe you don't, but if you're the kind of man we're looking for, you'll read every word, and the few minutes you spend with me now may well be the most profitable minutes you've spent in years.

Here are the facts. A few years ago the big national manufacturers of refrigerators began to advertise "automatic defrosting" as extra equipment. Since defrosting a refrigerator has always been one of the messiest and most hated tasks for every housewife, the idea caught on like wildfire, and these companies have spent and are spending today millions of dollars in advertising it. They succeeded beyond their wildest dreams and automatic defrosting is the most wanted feature in every refrigerator line.

Now, we're not in the business of making and selling refrigerators. But we saw an opportunity such as comes rarely to any man or any business. We saw the millions and millions of older model refrigerators that would remain in use for many

years. We also saw that millions of new refrigerators would not have automatic defrosting because new refrigerators with automatic defrosting cost from \$40.00 to \$60.00 more than those without it, and that's a lot of money many people just can't afford to pay.

The result was the invention and development of a product that could be attached in a few minutes to any electric refrigerator and provide the same automatic defrosting offered by the new and costly models. We priced it low to bring it into every home, at just a fraction of the price asked by dealers. And we decided that direct selling to the housewives was the best way to market it.

What's more, our product was so good, performed so well, that we offered it on a Free Trial Plan which required no real selling. Our salesmen simply asked permission to install this defroster free for a few days. When they came back, in 8 instances out of 10, the housewife wouldn't let the salesman take it back! Once she experienced the convenience, the food economy, the peace of mind that the automatic defroster brought her, you couldn't take it away from her with a team of horses.

But we were not satisfied just to offer this perfectly-engineered, handsome, highly-efficient automatic defroster at a low price—with a strong Guarantee of Satisfaction—and with a powerful sales plan. We did more! We employed one of the most noted and respected Independent Testing Laboratories in the world and paid them thousands of dollars to put the defroster to every test. They came up with perfectly amazing proof of important savings in electricity bills and in family food bills. They proved that the defroster pays for itself in just a few months. This proof, available only for our product, has been powerful ammunition in the hands of salesmen and has made it easier to make sales and increase their profits!

It was no wonder, then, that salesmen flocked to this product from far and near.

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And yet the market is hardly scratched! Millions of housewives are waiting for this sensational convenience. The opportunity to clean up fantastic profits with this product beckons to every man who has been looking for something to sell that's needed, wanted, and will make him welcome with our powerful Free Trial Plan.

Maybe you have seen defroster advertising before, or maybe this is the first time. But decide this minute that you will look into this proposition. Don't obligate yourself in any way. Just mail this coupon and let me send you all the proof, all the facts. Let me tell you the whole story and then you can decide for yourself. I hope you act today, because your territory may yet be open. Just mail this coupon to me—JACK FLAX, 173 W. Madison St., Suite 516, Chicago 2, Illinois.



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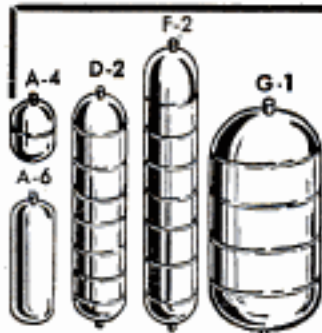
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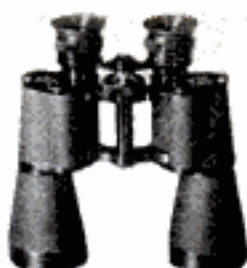
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100 DIFFERENT Stamps and illustrated price lists. 10c. Approvals. Dahlquist, Omak, Washington.

SPEND Pennies! Not dollars! Thousands of fascinating stamps to choose from our 1c and 2c approvals. No premiums. Just honest value. Pat F. Knowles, Box 2347, Van Nuys, Calif.

100 DIFFERENT British Empire 10c. Approvals. Sadler, 9013 Central, Kansas City 14, Mo.

U.S. Plate blocks, lowest prices. Comco, Box 56, Brooklyn 29, N. Y.

50 PACIFIC Islands stamps. \$1.00. Kiwi Stamps, Box 1916, Christchurch, New Zealand.

FREE Sample—interesting, informative, illustrated! National Stamp News, Anderson, South Carolina.

OLD U.S. approvals. Low prices. MacG., 2903 Observatory, Cincinnati 8, Ohio.

CIPEX Souvenir sheet plus 25 different U.S., 10c. Approvals accompany. Village Stamps, 90-39P 214 St., Queens Village 28, N. Y.

100 DIFFERENT British Colonies, 10c. Approvals. Boulder Stamps, Box 578, La Mesa, California.

50 DIFFERENT United States 5c with bargain approvals, lists. Bookman, Manatee 1, Florida.

25 PORTUGAL. Mystery gift; 10c. Smithco, Northeast 6618, Kansas City 23, Mo.

SENSATIONAL, United States, United Nations, Confederate States, catalogue free. Stone's, 45 Bromfield, Boston 8, Mass.

1000 DIFFERENT World \$1. Madco Co., 197 Maple, Irvington 11, N. J.

U. S. Approvals, mint, used! Square Deal Teal, 663 Beach, Rochester 12, N. Y.

WANTED—Stamp collections, accumulations, covers. Gold, 62-95P Saunders, Rego Park 74, N. Y.

96 PAGE Illustrated U. S. price list. Send 10c, cost of mailing, DeLisle, 154 S. Second St., San Jose, Calif.

TRY Our 1c, 2c, 3c, approvals. Catalog values disregarded. Raines, 7216 Irvine St., North Hollywood, Calif.

DIRECTORY of 113 hobbies magazines (15 Stamp) 25c. Maurice, 8837 Quincy, Detroit 4.

100 U. S. Commemoratives, 100 world collectors' information, \$1. S. Penniston, Norborne, Mo.

GOLDFISH Sheet U. S. catalogue 10c. Ace, 1431 Grace, Cleveland 7, Ohio.

U. S. Parcel post pictorials Q 1/12 complete, used \$8.75; mint \$37.50 to adult collectors supplying want list, references. Gil Huppert, Box 12A, Brooklyn 29, N. Y.

INTERESTED Contacting stamp collectors outside New York including foreign countries. Box 1715, 221 W. 41, New York.

ANTIQUES, RELICS, INDIAN GOODS, CURIOS

4 PERFECT Arrowheads \$1.00. Flint knife 35c. Perfect pipe \$3.50. Flesher 35c. Tomahawk \$1.00. Flint fish hook \$1.00. List 10c. H. Daniel, Lamar, Ark.

INDIAN Beadwork, leathers, beads, feathers, moccasins, wigs, supplies; buying direct from Indians; prices reasonable. Free list. Pawnee Bill's Indian Trading Post, Box 35-P, Pawnee, Oklahoma.

4 SELECTED Arrowheads \$1.00. List 5c. H. Talburt, Calico Rock, Ark.

6 GEM Arrowheads \$2.00, 4 fine arrowheads \$1.00. Notched tomahawk \$1.00. List free. Lear's Glenwood, Arkansas.

PRECIOUS STONES, MINERALS

12 ATTRACTIVE Genuine mineral specimens \$1.00. Capital Gems, Box 141, Orange, N. J.

GEMCUTTING, Silvercraft authority. Illustrated magazine tells how. Cut rocks, make jewelry. 150 ads illustrating equipment, offering gems for collectors, cutters. Postal brings literature. Lapidary Journal, Drawer B, Palm Desert, Calif.

GEMSTONES, Mineral specimens. Every variety. Lowest prices. Free booklet. Plummer's, 4720 Point Loma Ave., San Diego 7, Calif.

ROCKS, Ores, minerals precisely analyzed \$5. Absolute spectrographic detection of 45 elements including uranium. Free information. Keldon Research, Box 2555P, Los Angeles 54, Calif.

FUN With rocks! Rockhound's own monthly magazine featuring mapped trips, gem cutting, silverwork, minerals. 9,000 already enjoy it, so will you. Only \$3.00 year. Gems and Minerals, Box 716P, Palm-dale, Calif.

SAPPHIRE, Topaz, tourmaline, garnet, peridot, 5 uncut gem specimens, \$1.00. O'Brien's, 1115M Wilcox, Hollywood 38, Calif.

ROCKHOUNDS—Free catalog of rock and mining books. Or send \$1.00 for "Gold Panning." Fouray Books, 1306 1st Ave., Seattle, Wash.

GENUINE Red Arizona rubies (garnets). Send quarter for packet. Bitner's, Box 1025-B, Scottsdale, Arizona.

ROCKCRAFT Instruction book \$1.00. Guaranteed. Dewing, 1923 Empire, Burbank, Calif.

COLLECTION Colorado gems, \$1.00. Bader's, 839 East Las Animas, Colorado Springs, Colorado.

LAPIDARY—Four square inches native Texas stones slabbed 3/16" thick. \$1.00 to Rocks, Box 6617, Houston 5, Texas.

HOBBIES AND COLLECTIONS

UNUSED Matchbook covers, 100 different \$1.00. 36 page catalog 25c. Match-cover album \$3.00. Charles Edelman, 1311C East 84, Cleveland 3, Ohio.

NAZI, Soviet, medals, campaign ribbons. Big packet. Lists, \$1.00. Medcrafts, 1923 34th St. S.W., Calgary 2, Canada.

INVENTING Can be an interesting and profitable hobby. Write for complete particulars. Institute of American Inventors, Dept. 40-E 631-E St. N.W. Washington 4, D. C.

50 DIFFERENT Army embroidered patches \$1. Other bargains. Insignia Mart, 703A Broadway, New York 3, N. Y.

WANTED: Cigarette, tobacco cards. Write Charles Bray, East Bangor, Penna.

WORLD'S Smallest Bible 50c. Three, \$1.00. Emptre's, Box 301, Amesbury 2, Mass.

FREE Giant Popular Mechanics 40 page book catalog! Over 400 books to choose from. Send name and address to Popular Mechanics Press, 200 E. Ontario, Chicago 11, Ill.

CAMERAS, PHOTO SUPPLIES

BASS Says: Quality cameras since 1910. When in Chicago visit the camera cross roads of the world, or write us for your favorite equipment, new or used. Satisfaction guaranteed. Bass Camera Co., Dept. AG, 179 W. Madison St., Chicago 3, Ill.

PHOTOGRAPHY For pleasure or profit. Learn at home. Practical basic training. Long established school. Free booklet. American School of Photography, 835 Diversey Parkway, Dept. 3432, Chicago 14, Illinois.

WHOLESALE Photographic supplies. Cameras, films, projectors, enlargers. Write for free catalog. Capitol Photo Supplies, 2428 Guadalupe, Austin, Texas.

FREE Photographic bargain book packed with hundreds of fine values in still and movie cameras, lenses and latest accessories, both in new and used. Write now for your free copy to Central Camera Co., Dept. 8E, 230 S. Wabash Ave., Chicago 4, Ill. (Photographic headquarters since 1899.)

20 to 40% Discount. Everything photographic. Dart, 3812E Atlantic Avenue, Brooklyn 24, New York.

ENORMOUS Camera profits. Five complete plans and over 100 best selling markets, send \$1.00. Kappeler, 438 Queen St., Woodbury, N. J.

WILD Animal and bird films in beautiful color or b. and w. 2" x 2" slides and 8mm or 16mm movies. Write for free literature. Wild Life Films, 5151 AP Strohman Ave., North Hollywood, Calif.

BUY Wholesale nationally advertised cameras, photo supplies, thousands other products at big discount. Free "Wholesale Plan." American Buyers', 629-RR Linden, Buffalo 16, N. Y.

3-D Camera, viewer, slidemounts, \$20.00 complete. Keys Stereo, 3823 East 7th, Long Beach 4, Calif.

DISCOUNTS To 40%—Cameras, projectors, tape recorders, lenses. Write for individual quotations, no catalogs. Classified Camera D, 253 E. 94 St., Brooklyn, N. Y.

HUNDREDS Of helpful, practical articles in Popular Mechanics "Photo Handbook." A guide to better pictures, more profit, section on gadgets and equipment. Save dollars—get expert aid. \$2.00, 158 pages. Popular Mechanics Press, 200 East Ontario, Chicago 11, Illinois.

PHOTO FINISHING

TRIAL. Rolls developed, printed jumbo size in attractive album folders, 25c and this ad. Reprints 4c. Church's, Enterprise, Ore.

ROLL Film or reprints. Jumbo 8, 30c; 12, 40c; 16, 50c. Bobbs Photo Service, Box 23, Fairmont, W. Va.

THE Photo Mill. Immediate service. Eight exposure roll developed and one print each good negative 30c; two, 40c; one jumbo each 35c; two 65c. Write for complete prices and mailers. The Photo Mill, Dept. K, 1511 Hennepin, Minneapolis, Minn.

TWO Beautiful prints from each picture on roll. 8 exposure 35c, 12 exposure 45c. Thirty-three years of satisfied customers. Quick service. Lens Photos, Dept. J-4, Janesville, Wis.

FAST, Same day service! 8 oversized prints only 35c; 12-50c, 16-65c. Satisfaction guaranteed. This ad worth 10c toward first roll. Trial offer only! PicSure, Box 899-B, Philadelphia 5, Penna.

BEAUTIFUL Enlargement from each picture on roll. 8 exposure 35c; 12 exposure 45c. Cut Rate Photos, Dept. B-4, Janesville, Wis.

GUARANTEED Quality. Fast service. Eight jumbos in beautiful super pak plastic ring binder albums only 35c. Send for free mailers and particulars of our complete photo finishing service. Grand Fotos, O.P.O. Box 1410, New York 1, N. Y.

TWO Prints each good negative, 8 exposures, 35c; 12 exposures, 50c; reprints, 4c. Mayfair Photo Service, Box 617-K, Toledo 1, Ohio.

TOP Quality. Fast service. 8 jumbos 35c in beautiful super pak album, 16 contacts 40c. Reprints—Jumbos 4c; contacts 3c. Satisfaction guaranteed. Write for free mailers and circulars. Fast-X-Photo, Box A, Jersey City, N. J.

CUSTOM Jumbo album prints! 8 exposure 35c; 12, 50c. Special! 35mm 36 exp. \$1.00. Free mailer. Flash Foto, Box 36M, Brooklyn 4, N. Y.

8 OR 8 Picture roll 35c, 12 or 16 picture roll 55c. Each roll developed and printed in handy album pack. Send coin with roll. No c.o.d.'s. Mailing containers sent free. Deluxe Film Service, Box 1268-A, Shreveport, Louisiana.

ENLARGEMENTS. 8x10 Oil colored \$2.00. Miniatures, Free price lists. George Brewer, 5864-D Hollywood Blvd., Hollywood 28, California.

ENLARGEMENTS! Eight 5 x 7's or five 8 x 10's. \$1.00. Wilart Enlargers, Box 967, Little Rock, Ark.

12 JUMBOS From any size roll developed 25c with this ad only. S. Skrudland, Lake Geneva, Wis.

FREE 2 Reprints your favorite negative, June 1954 only. Extras 5c each. Get acquainted with real quality. Send 3c stamp. Delco, Box 362, Upper Darby, Penna.

PHOTO Stamps! Reproduced from your negative. Illustrated circular free! Beecher Sales, Box 2161-B, Cincinnati 1, Ohio.

8 JUMBO Prints in album 30c; 12 exp. 45c; 20 exp. 85c; 36 exp. \$1.25. Free mailer. Mel's Photo, Box 106P, Brooklyn 20, N. Y.

OVERSIZE Prints no extra charge. 8-exposure roll, 30c. 12-exposure, 45c. 16-exposure, 55c. Reprints oversize 4c. Finest quality. Mail Order Photo Service, Box 297, Watertown, Wisconsin.

SPECIAL Offer—8 jumbos 25c; 12, 35c, with this ad. Western Photo, PM64, Box 288, San Francisco 1, Calif.

WALLET Photos, double weight silk finish, for gifts, applications, made from any picture of you, your baby, wedding etc., 20 for \$1. Money back guarantee. Send picture (returned unharmed) and \$1. Delco, Box 362, Upper Darby, Penna.

ENLARGEMENTS—3 5x7 in attractive plastic-bound book. Send 3 favorite negatives and \$1.00. Cohen's Photo, 3108 Pleasant Valley, Altoona, Penna.

FREE Flash Exposure Guide for color, b&w. Rush postcard with this ad, name and address. Garden City Photo, Box 237-H, Garden City, N. Y.

QUALITY Color enlargements from your transparencies! 2 1/4 x 3 1/4 22c each, 9 for \$1.89. 3 1/4 x 4 43c each, 6 for \$2.35. 4x5 50c each, 4 for \$1.90. 5x7 85c each, 3 for \$2.40. 8x10 \$1.89 each, 3 for \$5.35. Minimum order \$1.00. No c.o.d.'s. Panoram Film Labs., Dept. M, 1190 6th Ave., New York 36.

TWO-Bits (25c) 8-exposure roll developed, jumbo prints. Electronically processed, satisfaction guaranteed. 12 exposure 35c! 16 exposure 50c. 35 mm. fine-grain 20 exposure 90c. 35 exp. \$1.25. Dated borders. Reprints, jumbo, 4c (minimum 5). Cash only. No stamps. Fast service. Alamo Photo Co., Dept. A, San Antonio 6, Texas.

MOTION PICTURES AND SOUND EQUIPMENT

8-16MM. Silent-sound film rental library. Free catalogue (sample film 10c). Garden, 317 West 30th, New York 19.

5,000 8-16MM. Silent-sound films. International, 2120 Strauss, Brooklyn 12.

CLEARANCE Sale of 16mm. sound films. Want a real buy in 16mm. sound films? Take advantage of the I.C.S. 1954 clearance sale of 16mm. sound features, comedies, cartoons, educational films, religious subjects—new, used. Send for our giant list "A" today stating machine you own (make and model). Institutional Cinema Service, Inc., 1560-PM Broadway, New York 36, N. Y.

EARN Up to \$15.00 daily with your movie projector! Details free! Metcalf, 10806 Glenroy, Chicago 43.

MOVIE Camera film: 8mm. roll \$1.50, 16mm. 100' \$3.00. Free processing. Better Films, 742 New Lots, Brooklyn, N. Y.

TAPE Recorders, tapes, accessories. Unusual values. Dressner, 624-M East 20th Street, New York City 9.

GUARANTEED Fresh 8mm. roll, magazine; 16mm. roll, magazine movie films. Color. b&w. Free catalog. ESO-R, 47th Holly, Kansas City 2, Missouri.

16MM. Sound projectors, film, rental, sale. Free catalogs. National Cinema, 71 Day Street, New York City.

ROSE Parade sale—16mm. silent, 100 feet \$11.00. Guaranteed. 653—26th, Manhattan Beach, California.

WANTED Moving picture machine, magic lanterns, films, posters manufactured before 1914. Malkames, 7 Plymouth, Tuckahoe 7, N. Y.

DIME Brings 32-page catalog bargains in new, used 16mm., 8mm. films, used 16mm. sound projectors, new 2"x2" color slides. Blackhawk Films, 1244 Eastin, Davenport, Iowa.

8MM. And 16mm. professional national parks movies in Kodachrome, list 10c. Ideal Service Supply, Suite 506, 20 West Jackson Blvd., Chicago 4, Illinois.

MUSIC AND MUSICAL INSTRUMENTS

WANTED! Poems for musical settings. Write Songwriters' Service. Clifton, N. J.

YOUR Voice made loud, clear and powerful with my diaphragm exerciser. Inexpensive. Write, Inventor Oz, 34V, Box 665, St. Louis, Mo.

ACCORDIONS. Wholesale to everyone. Save up to 60%. All national known brands. Free catalogue. Del Principe, 29 South Cicero, Chicago 44.

SONGPOEMS Wanted. Mail to: Tin Pan Alley, Inc., 1650 Broadway, New York 19, N. Y.

SWISS Music movements assorted tunes \$1.70. Helax, 218 West 72nd Street, New York City.

POEMS Wanted for musical setting. Send poems. Free examination. Crown Music Company, 1476 Broadway, New York City 36.

FREE Record of your song. Your words, my melody. Free information. Johnny Mack's Melody Mart, 1094 West 39th Street, Dept. A, Los Angeles 37.

SONGWRITERS! Protect your ideas! Hold all songs, poems! Write for safe correct procedure first! Song Service, Dept. P, 333 W. 56th St., New York 19, N. Y.

POPULAR Songs. How to write and sell them. Write for free booklet Successful Songwriting. Gateway Songs, Box 2470, Hollywood 28, Calif.

SONGWRITERS! Send poems, songs. Music Service, 243 West 72nd St., PM, New York 23.

WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 4700 South California Avenue, Chicago.

POEMS Wanted for musical setting. Send poem for immediate consideration and free rhyming dictionary. Richard Brothers, 24 Woods Building, Chicago 1.

SONGWRITERS! Outstanding offer. Ray Hibbeler, C-5, 6808 Cleander, Chicago 31, Ill.

POEMS Wanted for musical setting. Send poems. Free examination. Five Star Music Masters, 630 Beacon Bldg., Boston, Massachusetts.

1954 ACCORDIONS—Wholesale. Free catalog. American Accordion Center, PM-6, 5329 Belmont, Chicago.

MUSIC Arranged, songs printed. Frank Wildt, Music Publisher, Lancaster, Penna.

POEMS Wanted! For musical settings. Write Songwriting Service, 2959 Division, Chicago 22.

WANT Success? Your lyrics, songs, examined for recording, publishing possibility. Free "Guide-Aid to Success." Meteor, 301 Alliston St., Boston 46, Mass.

RADIO AND TELEVISION

DIAGRAMS For repairing radios \$1.00. Television \$2.00. Give make and model. Diagram Service, 672-PM, Hartford, Conn.

COLOR Television! Enjoy 3 color television screen now. Easily attached. No tools needed. Beautiful color tones. Cuts down glare and snow. Send \$1.00 for size 10", 12" or 14"; \$1.25, 17"; \$1.50, 20"; \$2, 21"; \$2.50, 24"; \$3, 27". Prompt shipment. Satisfaction guaranteed. Dealers opportunity. Zingo Products, Johnstown 7, New York.

CLEARCO Crystal radio kit \$1.50; preassembled \$1.75. Free catalogue. Clearco Crystal Co., Box 1857, Milwaukee, Wis.

FREE. Get on our radio and electronics mailing list. A.R.I., Box 1438, Denver, Colorado.

CRYSTAL Radio experimenters. Write Leslie Hulet, R4, Lakewood, New Jersey.

LEARN Radio repairing, instructions \$1.00. Slate's Radio Service, Corsicana, Texas.

NEW TV catalog free. Loaded with bargains for TV servicemen, technicians, installers. Finest new TV antennas, motorless directronics, multi-channel yags, UHF antennas, converters, motors, boosters, parts, instruments, hundreds of quality accessories at money-saving prices. Get your catalog now! National Electronics, 3006 Delco Bldg., Cleveland 3, Ohio.

MAKE Simple, tubeless, batteryless, distance-getting radio. Genuine Melomite crystal, detector, illustrated instructions. 50c postpaid. Allen, 427-PM5, Clinton, Missouri.

BUILD 15 Radios at home—Only \$19.95 complete. Learn radio construction, theory, trouble-shooting, code, P.C.C. regulations. Complete radio course includes all parts, components, instruction books, etc. Free radio tester and soldering iron. You keep everything. No experience required. Money-back guarantee. Order direct or send for descriptive literature. Valuable radio and TV guide upon request, free of charge, no obligation. Progressive Edu-Kits Inc., 497 Union Ave., Dept. PM17, Brooklyn 11, N. Y.

TURN Radio on and off from a distance. Complete unit \$1.25. Potential Radio, 446 Crown St., Brooklyn, N. Y.

LEARN Code! New electronic "Mini-code" practice oscillator makes it easy! Only \$5.00 postpaid. Guaranteed. Stout, 2241 E. Broadway, Muskegon 1, Michigan.

STOP TV commercials. Make your own Gab-Off. Simple instructions 50c. Davies, Box 362, Westmount, Quebec, Canada.

MAKE Your own television antennas. Instructions 35c. Pfeiffer, 4609 21 Ave., Astoria 5, N. Y.

FREE List. Pictorial construction plans. "Builder's Handbook." 25c. Alena, Box 24, Astoria 6, New York.

INCREDIBLE! One tube radio receives television, FM, CAP and amateur broadcasts. Very easy and inexpensive to build. Diagram with special tube only \$2.00. Springfield Enterprises, Box 54-B6, Springfield Gardens 13, New York.

EXPERIMENTERS, SWL's, beginners. June "Radio Science" 25c. 52 1/2 Backman, Westfield, New York.

BUILD Radio—T.V. troubleshooters. Instruction book \$2.00. Tele Diagnosis, 155 West 72, New York, N. Y.

PHONOGRAPHS Attached to any radio by anyone. Instructions \$1.00. Box 601, Phenix City, Ala.

BUILD Your own top quality TV set. We supply complete equipment, tools, instructions as part of America's finest home-study TV course. Be a high-paid TV technician. Install, repair, service all makes of sets. Many excellent jobs now open. Or start your own business. Get full facts free. Write: Commercial Trades Institute, Dept. CT2-6, 1400 Greenleaf Ave., Chicago 26, Ill.

TELEVISION Antenna plans. Channels 2-13. Make money rebuilding antennas for new channels. Complete dimensions, drawings \$1.00. Kelley Electronics, 29-B Clymer, Burlington, Vt.

CRYSTAL Radio kit, guaranteed to work. \$1.50; phone \$1.75. Clearco Crystal Co., Dept. 9, 1229—25th, Des Moines 11, Iowa.

15 TESTED One-tube circuits 25c, including "Radiobuilder" catalog. Laboratories, 328-C Fuller, Redwood City, Calif.

BUSINESS OPPORTUNITIES

BEGINNERS. 10,000 Word book "Build Your Own Mail Order Business." Honest. Profitable. Facts. Ideas. All meat, no advertising. 25c refundable. Bertelsman Services, 85 Nineteenth, Newport, Ky.

MONEY. Typing, sewing! Details free. Edwards, 3915-PM, 12th, Des Moines 13, Iowa.

START A lettershop on a shoestring! Sales \$56,000. Started \$38.00. Information? Merritt, Box 13, Basking Ridge, N. J.

DO It with "Floating Henryburgers." Over million sold in 1953. Rare opportunity. State type of place now operating or present occupation. FH Systems, P.O. Box 936, Wichita, Kans.

PRINT without a printing press! Amazing new method! Print colorful signs, banners, cards, posters, glasswear; anything at home. Big profits. Money-making opportunity! We supply everything. Beautiful sample, home-business plan free! Write Screen-Print Company, Los Angeles 15, California.

\$900 A Year sparetime sharpening saws at home. No selling. Hardware stores get saws on commission basis. Free booklet tells how. Victor Foley Company, Columbia Heights, Minnesota.

MAKE Money at home as renewal headquarters for all magazines. Liberal commissions. No experience. No capital needed. Supplies furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500B, Mount Morris, Ill.

OVER 700% Profit making finished photos in 2 minutes on the spot in daylight without darkroom. No experience needed. Simple directions teach you quickly. Write P D Q Camera Co., 1161 N. Cleveland Ave., Dept. PM, Chicago 10, Illinois.

ELECTROPLATE Auto parts, novelties, mirrors, baby shoes. Easy, inexpensive home processes. Free booklet. Tyco Metals, Box 13231-MM, Houston 19, Texas.

BOOKKEEPERS. Keep books, small firms spare time. Manual latest technique by C.P.A., \$3.00. Modern Business, Box 406, Youngstown 1, Ohio.

MAKE Money at home doing easy pleasant work. Everything furnished. Good earnings. Write Murray's, Box 4066, Mott Park Station, Flint 4, Michigan.

SELL To women by mail from your home—Repeat order merchandise. Everything furnished. Big profits. Mohawk, 37A, Second, Amsterdam, N. Y.

GET Newest, best merchandise, book mail selling offers. National, Box 88A, Dorchester 22, Mass.

MAKE Money at home—Mail cards, circulars feature real merchandise. Everything furnished. Big earnings. Philip's, Box 3-P, Boston 22, Mass.

ESTABLISH Profitable automatic shoe shine route. Proven. Write Jiffy Shine, 1630 S. 2nd St., Philadelphia, Penna.

UNUSUAL Mail order ideas, sources. Details free. Fax, Box 241, Brownwood, Texas.

START Your own mail business at home in your sparetime with small investment. Proven merchandising methods. No crackpot schemes. Write, Craig, Southern Pines 1, North Carolina.

AMAZING Opportunity! Start profitable collection agency! Become co-partner. Valuable franchise available. Write: Edmondson, Box 4865-P, Atlanta 2, Ga.

RECAST Old batteries into new. Latest achievements. Battery Laboratories, Minneapolis.

LEARN Metalizing baby shoes, gifts, etc. Bronze, gold, silver. Folio free. Kiklav, 7217-PM South Broadway, Los Angeles 3.

WHOLESALE Of sensational nationally advertised appliances, silverware, watches, cameras, etc. Start your own business. Full details. Send 30c for catalogue. International Sales Co., 175 Fifth Ave., New York 10, N. Y.

TERRIFIC Home business opportunity. Mail literature featuring real merchandise to new mothers. Everything furnished. Schlott, 219C 5th Ave., Brooklawn, N. J.

START Venetian blind laundry. Profitable lifetime business. New machine. Free booklet. F. C. Co., 442 N. Seneca, Wichita 12, Kansas.

RAISE Rose bushes. Full instructions \$1 cash, check, m.o. Marvin Todd (Nurseryman), Route 7, Box 572, Tyler, Texas.

UNUSUAL Home-work opportunity. Spinning Angora sparetime for us. Men, women. Angora House, PM, Springfield, Illinois.

HOME Business mailing literature to new mothers. Details free. K & M Products, 3634-A Homewood, Toledo 12, Ohio.

HOW And where to obtain capital. Particulars free. Star Service, Wapakoneta, Ohio.

MAKE Money at home. Write, Falcon House, Winnebago 2, Ill.

TO \$40.00 Weekly. Sparetime, home operated mailorder business. Successful beginner's plan. Everything supplied. Lynn, 10420-M National, Los Angeles 24, Calif.

SPARE Time business. No investment. Details free. Howell, 1320 St. Andrew, New Orleans 13, La.

COPUBLISH Mail Sale Advertiser, leading mail order paper. Details, latest copy, dime. Vanroy Shirk, Lebanon, Penna.

EARN Money at home! Homemaker Magazine tells how. Sample, 25c. Sizemore, Box 7, 4917 Kostner, Chicago 30.

DOLLARS In personalized baby record books. Sell by mail. Eleven thousand new prospects daily. Use same literature we do. No-Co-Ro, Oakland 6, California.

MAKE Rubber stamps, repair dolls; learn silk screen printing; invisible reweaving. Catalogue (60 ideas) free. Universal, Box 1076-A, Peoria, Ill.

SCHEMER Magazine. Canfield 1, Ohio, monthly mailorder ideas, plans. Year \$1.00. Sample 20c.

PLASTERCRAFT Molds. Liquid rubber, plasters, flocks, candle supplies. Catalog and manual free. Blue Rapids Supply, Blue Rapids, Kansas.

GROW Mushrooms. Cellar, shed, and outdoors. Spare, full time, year round. We pay \$3.50 lb. We paid Babbitt \$4,165.00 in few weeks. Free book. Washington Mushroom Ind., Dept. 172, 2954 Admiral Way, Seattle, Washington.

BUY It wholesale! Manufacturers, distributors offer 850,000 items. Literature free. Olsen, 1231-A East Third St., Duluth 5, Minn.

BOOKKEEPERS, Increase earnings operating sensational bookkeeping service. Kern, 4942 Vineland, North Hollywood, Calif.

MINIATURE Trees. Why pay \$2.00—\$10.00 for growing secrets? Free details. Tiny Trees, 5038 N. Winthrop, Chicago 40.

POPCORN And potato chip equipment. Leco, Box 933-A, Springfield, Ohio.

\$46 FROM Square foot plywood; jigsaw necessary. Write: Woodarts, Bridgewater, Mass.

BUY Wholesale thousands items. Lists free. Cottage Industries, Omaha 12, Nebr.

\$25 WEEKLY Working two hours daily at home. Lycke, Box 2471-A, Cleveland 12, Ohio.

START Your own profitable home mail-order business! We supply everything! Write today! Studio Products, Box 564-A, Glendale 5, Calif.

BREED Rare tropical fish at home. Earn big money! Learn secrets! Help fill huge demand. Amazing opportunity! Free plan. Tropicals, 1008-P Los Angeles St., Los Angeles 15.

INCOME From local information. No selling. Write Neherco, La Verne, Calif.

RESILVERING Mirrors, torques 50c; two-way lookout mirrors, (No one sees you), 50c; coppered mirrors, 50c All \$1.00. Nelko-Mir, Box 3462-J, Chicago 54.

START Home manufacturing business. Make cleaners, soaps, polishes, cosmetics. Free literature. Kemix, Park Ridge, Ill.

LIVING Miniature ("Ming") trees only 10 to 20 inches tall. Grow at home. Big profits! Spare time opportunity. Fascinating! Amazing! Write for free seed and plan. National Nursery, Dept. FC, Inglewood 4, California.

MAKE Money spare or full time, casting metal toys and novelties. Big wholesale and chain store demand for autos, soldiers, ashtrays, banks, etc., keeps manufacturers busy. Production moulds furnished for up to 100 and more castings per hour. No experience or special place necessary. Write for information and illustrations of patterns needed. Metal Cast Products Co., Dept. A, 1696 Boston Road, New York 60, N. Y.

OPERATE Profitable mail order business. Write Walter Service, 4159-A East 112th, Cleveland 5, Ohio.

GOOD Paying business silvering mirrors, plating autoparts, reflectors, bicycles, bathroom fixtures, etc., by late method. No tanks or shop required. Outfit furnished. Free booklet. Gunmetal Co., Ave. H, Decatur, Illinois.

MINK Raising information free. Complete. Lake Superior Mink Farm, Superior, Eel, Wisconsin.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries Company, Grand Rapids, Minnesota.

FREE Book "505 Odd, Successful Businesses." Work home. Expect something odd! Pacific, OceanSide, Calif.

FIX Typewriters. Free booklet describes our modern, inexpensive home-study course. Factory methods taught. Write Typewriter, Building 1, Tarentum, Penna.

MONEY In new greaseless doughnuts. Start in kitchen. No smoke. Sell stores. Free recipes. M. Ray Company, 3665 South 15th Ave., Minneapolis 7, Minn.

VENDING Machines—No selling. Operate a route of coin machines and earn amazing profits. 32-page catalog free. Parkway Machine Corporation, Dept. 72, 715 Ensor St., Baltimore 2, Md.

BRONZED Baby shoe supplies, instructions, mountings. Metal bookends, \$1.50 pair. Free catalog. National Bronze Supply, Box 58, Los Angeles 32, Calif.

\$1,000 MONTHLY Possible from your own easily learned office business. Write Cole Associates, Syracuse 2, N. Y.

FREE! "301 Profitable Small Businesses!" Amazing shoeing plans! Work home! Start sparetime! Deumant Surveys, Kenmore 23-R, N. Y.

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GROW Orchids at home—Profitable, fascinating. Year 'round, Maine to California. No greenhouse. Gorgeous cattleyas, cymbidiums, etc. Successful home grower shows you how. Full details free. Flowerland, 4622-DZ Wilshire, Los Angeles 5.

NATURAL Molding rubber, extra thick. Free sample. Flock, tinsel, candle wax. W. Wooley, 115-A Donald, Peoria, Ill.

FORM A buyers or consumers group. My plan successful. Excellent moneymaking opportunity. Free details. Putnams, Box 74A, Columbus Grove, Ohio.

LIQUID Rubber, make flexible molds. Free sample. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

LEARN Sewing machine repair, electrify, trade, sell. How to make big money at home sparetime. New zigzag machines, parts, etc., wholesale. Free details. Taylor Service, Hamilton PM-6, Ohio.

\$26,500 SALES In two weeks! Amazing radio-mail order method. Free details. Broadcast Service, 1412-R Great Northern Building, Chicago 4, Illinois.

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OPERATE Escalator mailorder system, selling our products or any products. Fastest, most revolutionary mailorder system known. Write: Selbyco, Decatur 157, Ill.

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. MX-654, 7530 Greenwood, Chicago.

IMPORT And export possibilities listed. Get into business. Impex Bulletin, Three issues \$1.00. Victor Suarez, Box 38, Merida, Mexico.

START Your own business on credit. Your own boss. 1658 of our dealers sold \$5,000 to \$27,500 in 1953. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant profitable business backed by world-wide industry. Write Rawleigh's, Dept. F-U-PPM, Freeport, Ill.

NEWEST Spare, full-time home business. \$5 to \$10 hour possible. Paint with suede—The finish with touch and eye-appeal. Beautify auto dashboards, signs, radios, toys, figurines, lamps—1001 others. Complete, step-by-step instructions sent for no-risk examination. Free details. Coast, 1004-MV So. Los Angeles St., Los Angeles 15.

IMPORT-Export! Excellent homework. Opportunities bulletin 25c. Free details. Warners, Box 6, Fort Scott, Kansas.

EARN Extra money during your spare time. Sell subscriptions for popular magazines. Liberal commissions. Send for supplies, etc. DeSales Magazine Service, 60 East 42nd St., New York 17, N. Y.

MAKE Flexible molds. Cast figurines, plaques. Free sample. Tocker, 630-R Chestnut, Hamilton, Ohio.

SAVE Up to 30%. Nationally advertised merchandise. Ronson, Gruen, Wm. Rogers, etc. Appliances, jewelry, toys, silverware, household items. Resell make money. Illustrated catalog \$1.00. Refunded on first order. Wholesale Service, 866 P Aldine, Chicago, Illinois.

UP To \$50.00 a week sparetime. \$200-\$300 a week full time. Invest only a few dollars. Orders filled for you. Easy mailing in home. Details. Norman, 666 MP Aldine, Chicago, Illinois.

START Venetian blind laundry—Machine patented. Inventor, world's largest manufacturer explains how. Free booklet. Jet Company, 522 N. Rural, Indianapolis 1, Indiana.

SAVE Up to \$2000.00 for only \$2.00. Satisfaction guaranteed. Details free. Tailors, Box 206-B, Three Lakes, Wis.

START Profitable spare time business. Co-publish "Mail Order World" leading trade magazine. Opportunities and invaluable information for beginners. Sample copy 25c. Beecher Publications, Box 2161-B, Cincinnati 1, Ohio.

START Your own mail order business. "Mail Order Business Manual" reveals proven methods. No crackpot schemes. Bud E. Hine, Box 93, Battle Creek, Mich.

"TEXBURGER." The sandwich that is different. Guaranteed repeat seller. Big profits. No equipment to buy. Manual containing recipe and valuable information for sandwich shop operators sent postage paid only \$2.00. Haskell D. Boyer, P.O. Box 1486, Fort Worth 1, Texas.

MAILORDER Home business using free advertising method. Information free. H. F. Seigel, 7070 Hollywood Blvd., Hollywood 28, California.

OWN A garden golf business. Experience unnecessary. Brockway, Seaside, Ore.

SELL Popular Mechanics and all other magazine subscriptions. Free catalog, supplies. Subscription Service Company, Dept. A, P.O. Box 2070, Birmingham, Alabama.

BUY Wholesale. Thousands items. Lists free. Triple J. Industries, 132 Berkshire, Bridgeport 8, Conn.

MONTHLY Repeat business which you can operate in your own community. For free details write Grask, 321-28th Street, McKeesport, Penna.

COLOR Concrete with chemicals. Marble-glaze cement benches, pottery. Start home, shop. Many designs: birdbaths to waterfalls. Your chance for fame, fortune. 10c brings sample, pictures. Write: Hollywood Cementcraft, 8527-R Wonderland, Hollywood 46, California.

MONEYMAKING Opportunity! Operating home mailorder business. Sparetime, small capital. Jackson, Newfoundland 8, Kentucky.

WHAT'S Your field of interest? Whatever it is, specialized magazines will help you get ahead. Examine current copies of those covering your field through our easy-to-get-acquainted service. Choose from 4,367 covering all fields—Business, trades, agricultural, professions, insurance, real estate, music, educational, hobbies, sports, etc. Current list free. Commercial Engraving Publishing Company, 34C North Ritter, Indianapolis 19, Indiana.

START Home mailorder business. Details. Gedgard, Box 798-S, New York 1, N. Y.

OPERATE Profitable home mail-order business. Carry no stock. Details, 25c. Xebec, 814-M&M Bldg., Houston 2, Tex.

MAIL Circulars for advertisers. Write Siegel, Box 183, Knick., New York 2.

MAIL Letters from your home—Get 25-810 orders in every mail. Keep half. A. Dadson, 4815 Bellinole, Houston, Texas.

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EARN \$2.00 Hour! I do—making sandals. Young's, 1308-PM, South First, Arcadia, California.

BUY Wholesale 450,000 products. Literature free. Carter, Box 6011-B, Chicago 80.

CANDLEMAKING: Formulas, instructions, \$1.00. Formula catalog hundreds products included. Kemixer, Park Ridge, Ill.

PROVEN Way to finance own mailorder. Stone, Box 36 M, Reading, Mass.

MAKE \$50.00 Per day selling room air conditioners. Buy wholesale. Box 793, La Crosse, Wisconsin.

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GET \$10 Orders by mail: 100% profit! Teril, Bogard, Mo.

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MAILORDER Home business! Details stamp. Shirley, 20-Raspeburg, Baltimore 6, Maryland.

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EARTHWORM Breeding! Bait! Soil! Easy! Profitable! First get true story, "An Earthworm Turned His Life." Send dime. Earthmaster System, 8D, El Monte, Calif.

MAKE Perfumes, other products. Sell mailorder. Formula catalogue free. International, 6347 Parnell PM-6, Chicago 21, Illinois.

MILLION Articles wholesale. Supply source directory 10c. Idealer, Park Ridge, Illinois.

BECOME A game warden, or join forestry, park, lookout, wildlife conservation services. Enjoy outdoor work, good pay, real security. Complete information free! Write Home-Study Institute, 3156JE West Eighth, Los Angeles 5, California.

START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, 627-R Linden, Buffalo, N. Y.

CANDYLAND Profits: Sweet pleasure, old-fashion, modern recipes, tips, business plans. \$1.00. Buzick, Boulder Creek, California.

OPERATE Sewing machine repair business from home. Our guaranteed plan assures success. Easily learned. Amazing profits. Write immediately. Purdy's, 1416½ North Rusk, Weatherford, Texas.

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DOES Someone else reap the benefits from your day's work? Do you long to be independent? To make more money and still have time to enjoy it? Are you tied to your present job by lack of capital? Then this is for you: Be your own boss. Roll your dimes into dollars with a pre-fabricated drive-in! Completely equipped for business, erected on your lot, for less than the cost of a new car! Meets all health, builders, electrical codes. Priced \$2495 to \$3495. For details, write The Glacier Co., Dept. 6, 1216 Main St., Columbia, S. C.

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MONEY Getters club! Receive 1,000 or more different money-making propositions. Year's membership now only 25c. Satisfaction guaranteed or money back. Storm-Associates, Cedarville, New Jersey.

BUILD Luggage and cases at home. We sell your products. No special equipment needed. Free details. Casecraft, 805-P6 Sunset Blvd., Los Angeles.

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WANTED! Home producers, by manufacturers in our clearing house service. Become subcontractor, casting plastic products for these companies. Thousands of easy-to-make items required for consumer-industrial use. Cash in at home, without previous experience. Plastic Service Associates, Dept. 6-PM, East Boston 28, Mass.

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SENSATIONAL Home plastic business. Men and women make big money. Spare or full time. (Also valuable liquid marble information.) Free catalog. Write: Bing Products, PM-654, Watertown 72, Mass.

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GET Free copy of "Opportunity," the magazine that shows you the way to unlimited profit possibilities. Gilbert, Room 1700, 28 East Jackson, Chicago 4.

DOLLARS In your mail box daily. No stock investment. Particulars free. Gem, 44-B Atlantic, Pleasantville, New Jersey.

MAIL Letters featuring real merchandise. Get \$10 orders in every mail. 100% profit. Everything furnished. Products, Box 23, Boston 17, Mass.

MEXICAN Featherbird pictures. Big profits! Hot sellers! Edmunds, 3009 Weaver Ave., Baltimore 14, Md.

WINDSHIELD Wiper rebuilding brings big profits. Free particulars. Hardy's Service, 878 East Waterloo, Akron 6, Ohio.

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MONEY Found. Be our agent in your community. Top quality watches, diamonds, jewelry, etc., at wholesale prices. Amazing profits. Lifetime income. Experience unnecessary. Send for free catalog. Zerach Bros., 602 Mission St., Dept. M31, San Francisco 5, Calif.

EARN Extra income at home. Honest, dignified, steady self-employment. Local or mailorder. Graham Company, 1238 Granger Ave., Lakewood 7, Ohio.

HOUSEWIFE'S Delight. Apron with two matching potholders. Terrific sales appeal. Details-sample 70c. Step Saver Mfg. Co., 1671 Milwaukee Ave., Chicago 47, Ill.

PRINTING And office supplies wholesale. 20,000 items. Literature free. Royal, Box 368-A, Cleveland 23, Ohio.

CHINCHILLAS: Profitable. Raise in spare room, cellar. Terms. Ross Chinchilla Ranch, 749 Rincon, El Sobrante 11, California.

FLEXIBLE Rubber moulds for plaster and Marble figurines. Sample and large illustrated catalog 25c, refunded on first order. K-C Novelties, Dept. 4, Easthampton, Mass.

GROW Mushrooms. Cellar, shed, and outdoors. Spare, full time, year round. We pay \$3.50 lb. We paid Habbitt \$4,165.00 in few weeks. Free book. Washington Mushroom Ind., Dept. 173, 2954 Admiral Way, Seattle, Washington.

SPARETIME Profits taking subscriptions, all magazines. Wholesale catalog free. Cassell Agency, Westfield 2, New Jersey.

EARN \$50.00 Daily making mats, shoes and mud guards from old tires. S and S Patents Inc., 1307 North Clark St., Chicago 10, Ill.

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50,000 ARTICLES Wholesale. Source directory dime. Nelko, Box 3462-DR, Chicago 54.

READ Progressive Mailtrade, the magazine that tells how to make money by mail. Dime brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.

FREE Book "505 Odd Successful Businesses." Work home. Expect something odd! Pacific, Oceanside, Calif.

PUBLISH Your own magazine. Handsome 52 page format, well edited, illustrated. Cost low as \$1.00 month. Brings you prestige, profits. 25c brings sample, details. National, Ord. Nebr.

GENERAL Contest Bulletin. Issued monthly. Sample. 10c. 1609½ East 5th, Duluth, Minn.

MAKE To \$4.50 hour doing common pen lettering. National Artists, 801½-A North Marsalis, Dallas 3, Texas.

MANUFACTURER—Wants reliable men-women for profitable mail order work. Home. Sparetime. Liebig, Beaver Dam 4, Wisconsin.

FOREIGN Employment construction work. If interested in foreign projects with high pay write Foreign Service Bureau, Dept. PM, Metuchen, New Jersey.

MONEYMAKING Opportunities. Literature galore, 10c, refundable. Robert Rich, Nevada 105, Mo.

TESTED Plans for home operated business. Free details. Gilchrist Sales Company, 13 Brown Ave., Cortland, New York.

\$10,800 PROFITS! Your own mailorder business! No risk! Success plan free! Treasury, 709 Webster, New Rochelle, PM-24, N. Y.

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TYPEWRITERS, Sewing machines can earn excellent spare time profits. Free details. McKinley, PM, Box 651, Canton, Ohio.

INCREASE Your income, turn your spare time into cash—Making quick-selling, highly profitable lamps and fiber glass shades. Every home a prospect for one or more. Hundreds already doing it, so can you. No experience needed. No special tools required. Gearon's big, new 72 page 1954 illustrated Catalog No. 8 will show you how, quickly. One special 2-page section shows 6 beautiful lamps in kit form, ready for you to assemble. Another 12-page section shows you how to make stunning, ultra-modern fiber glass shades. Page after page filled with wide variety of other attractive shades, shade frames, figurines, and lamp bases. Also oil lamp converters, boring compound, and all kinds of cords, sockets, pipes, harps, finials, bases, and hundreds of other parts. Everything you need. And you can buy everything wholesale, sell at retail, make big profits, fast. Send only 25c right now for Gearon's big 1954 catalog and wholesale price list. Like hundreds of others, you'll be glad you did. Gearon Co., Dept. 503-B6, 27 S. Desplains, Chicago 6, Ill.

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FREE! Many money making offers. Boyer, 65 Uptown, Hoboken, N. J.

NEW 7"x11" Ultra-blue signs. 7c, retail 50c. Sample free! Lowy, 812 Broadway, Dept. 793, New York 3.

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EARN \$25.00 Day taking phone orders for famous redwood seeds, seedlings, novelties. Rush dollar for kit. Empire Services, Box 1235, Santa Rosa, Calif.

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300% PROFIT Making and selling seamless wallets. Only scissors needed. Send \$1.00 for pattern. Barcklow, King St., Woodbury, N. J.

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ALUMINUM Awnings. Sell yourself, sell neighbors. Factory prices. Write All Weather, Box 10254, Tampa, Florida.

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HOME Mailers earn sparetime cash mailing our advertising literature. Jennings, 1540 First, Sarasota, Florida.

START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, 630-R Linden, Buffalo, N. Y.

FREE Folio describing "45,000; Unlimited Vacations Plan." No canvassing, mail-order, merchandise, equipment. Unknown. Works itself—home! Keep job. Haylings, Carlsbad, Calif.

BRAND New manual, 12 complete money-making plans, \$1.00. Kaiser, 136B Gamewell, Hackensack, New Jersey.

HUNDREDS Of dollars guaranteed! At home, sparetime. Easy instructions. \$1.00. How. Wetmore, (C) Texas.

COLLECT Names, addresses your community and sell. Cash daily. Some worth \$40 hundred. Instructions \$1.00. Fisher's 3213-P Mission, San Francisco, Calif.

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THERE'S Always work available for the man who owns Acme saw shop equipment, the most profitable of all to operate. Easy, fast, economical; life-time construction. Acme circular saw sharpener \$293.36. Acme handsaw filers, floor model \$345.00, bench model \$265.00. Motors, switches and lamps included. Send check or money order. Satisfaction guaranteed. Max Manufacturing Company, 138 Stockton Avenue, San Jose 26, Calif. (Mention Popular Mechanics.)

FORMULAS, PLANS, ETC.

MILLER'S Modern manufacturing formulas make fast-selling products that get the business and pay! Fifty years supplying the best. Late literature free! Liscombe Miller, Chemist, Tampa, Florida.

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FORMULAS, \$1 Each; home profits plans. Write: G. Calderon, 80 East 115th Street, New York 29, N. Y.

ANY Formula \$3.00. Catalog-mfg. treatise 10c. J. Belfort, 192 N. Clark, Chicago 1.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

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PRODUCT Analysis, manufacturing formulas, processes developed. Moderate fees. Plastics, Box 1574, Boston 4, Mass.

ANY Formula \$5.00. Satisfaction guaranteed. Jack, Consulting Chemist, 5138 Gainor, Philadelphia 31.

ANY Formula—\$3.00. Satisfaction guaranteed. Free lists. Miller, 24 Whitwell Place, Brooklyn 15, N. Y.

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PLASTIC Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

PLEXIGLAS Sheets—Cut to size. Clear. All thicknesses. Standard outdoor translucent colors. McClarin Plastics, P.O. Box 168H, Hanover, Penna.

PLEXIGLAS Lucite. Any size sheets. Square foot (12 x 12) cost. 1/16", \$1.18; 1/8", \$1.55; 3/16", \$1.90; 1/4", \$2.25. Add 15% for postage. Minimum order \$3.00. Almac Plastics, 600 Broadway, New York City.

FIBERGLAS. Polyester, plexiglas, acetate, vinylite. Casting, coating plastics. Maurice Lannon's Fiberglass "How" book now ready—\$2.50. Fast service, best prices. Catalog 10c. Gem-O-Lite, Box 6867P, North Hollywood, California.

PLASTICS Home-craft course for men and women. Tells and shows how to make hundreds of fast selling plastics products. All plastics and materials for 23 projects included in course. No special tools needed. Course pays for itself. Write for free booklet. Interstate Training Service, Dept. D-3-F Portland 13, Oregon.

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NEW Liquid casting plastic. Clear, colors. Preserve flowers, insects, photos permanently. Saw, drill, carve. Send 25c for Castolite Casting Manual and proved success plan showing how to make money at home. Castolite, Dept. G-101, Woodstock, Illinois.

HOME Business with liquid casting plastic. Complete kit \$3.00. Handbook 50c. Kemnitz Corporation, 2755 N. 5th Street, Milwaukee 12, Wisconsin.

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ILLUSTRATED Catalog: Chemistry, mineralogy, biology 20c. Tracey Laboratories, Evanston, Illinois.

NEW Idea chemical and apparatus outfits for home experimenting. Photo-scales, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 25c. Established 1931. John H. Winn, 124A West 23rd Street, New York, N. Y.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 25c. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

AMAZING New book of science. Experiments, formulas and catalogue of laboratory supplies. Only 25c. National Scientific Co., Dept. FM5, 2204 W. North Ave., Chicago 47, Ill.

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AGENTS WANTED

PRINTING. Salesbooks, envelopes. Free illustrated catalog. Eraco, Dept. PM, Bronx 72, N. Y.

SELL Wholesale nationally advertised merchandise. Your own business easily developed. Catalog, details—50c (refundable). Bergen Novelty Sales Co., Dean St., Englewood, New Jersey.

BIG Profits. Razor blades, other items. Free sample, lists. Hanson Sales, 4908-P Ohio, Chicago 44.

YOUR Own business—Used suits \$1.50, overcoats 65c, mackinaws 35c, shoes 12 1/2c, ladies coats 30c, dresses 15c. Enormous profits. Catalog free. Moro, 1218 South Jefferson, Chicago 7.

APPLIANCES, cameras, radios, toys, typewriters, watches. Large coded wholesale catalogue! Cam Company, 6806PM—20th Ave., Brooklyn 4, N. Y.

HAVE A complete store in your pocket. Buy wholesale and make big profits. Send for free general merchandise catalog now. Jay Norris, Dept. P, 445 Broome St., New York City.

PRINTING. Advertising salesmen—Excellent moneymaking sideline selling decalcomania name plates, small quantities. Automobile initials, sign letters. Free samples. Falco, XL, Boston 19, Mass.

CALIFORNIA Sweet smelling beads. Sensational sellers. Free particulars. Mission, 2328PM West Pico, Los Angeles 6, Calif.

WINDOW Sign letters. Samples free. West Coast Sign Letter Service, P.O. Box 697 Esca'on, Calif.

GOLD Or silver letters, numbers. Windows, doors, trucks. 1" to 6". 500% profits. Free samples. Atlas-T, 544 West 79th, Chicago 20.

BARGAINS. Job lots, close-outs! Save up to 50% on clothing, hosiery, notions, drugs, toiletries, gifts, jewelry, television, etc. 2000 items. 25c brings wholesale bargain catalog with special get acquainted offer which includes free \$1.00 merchandise certificate. Reliable Jobbers, 311-B North Desplains, Chicago.

SAVE 50-75% On household appliances. Free particulars. Wholesale catalog. Neublins-P. Sicklerville, N. J.

\$1.00 PROFIT Selling \$2.95 photo enlargement deal. Allen Studio, Riegler Bldg., Little Rock, Ark.

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MAKE Extra money. Sell front door name plates to friends, neighbors. Retail \$1.98; you make \$1.00! Free selling kit. Modern Engraving Co., P.O. Box 194, Boston 14, Mass.

AGENTS — 300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 431-D North Clark, Chicago.

BUY Wholesale. 25,000 items. Catalogue 25c. Matthews, 1472-B9 Broadway, New York City 36.

WHOLESALE Catalog! Rock bottom prices! Nationally advertised appliances, watches, typewriters, cameras, tools, toys, housewares, phonographs. Consolidated Distributors, Box 1537A, Paterson, New Jersey.

SAVE! Make big money in sparetime. Buy nationally advertised merchandise wholesale. Catalog 25c, refundable. A Sales, 18-PM City Terrace, Newburgh, N. Y.

BEAUTIFUL Feather pictures. 200% profit! Free sample. Apartado 9038, Mexico 1, D. F.

MEN-Women: 100% profit, taking orders for Sweet Georgia Brown beauty products. Colored people buy on sight. Sample offer. Valmor, 2451-BH4 Michigan, Chicago 16.

AMAZING Bath sponge. Washes back easily. Suds as it washes. Uses soap scraps. Big profit. Whirlwind seller. Write for free sample offer. Magica Products, Wollaston 70, Mass.

MAKE Money at home as renewal headquarters for all magazines. Liberal commissions. No experience, no capital needed. Supplies furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500A, Mount Morris, Ill.

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They Said I'd Go Broke Building This Battery



...but \$3,476,000 in sales
proved they were wrong!

by Frank E. Williams

Inventor of the Continental Life-Time Battery

If you've ever invented a new product, or worked out an improvement on an old one, don't be discouraged by people who say "you can't compete with big companies." Read my story. Then roll up your sleeves and get busy—it's easier than you think!

TWELVE years ago, I set out to develop an improved storage battery with the greatly increased power that I knew would be required for the cars of the future. In addition, I wanted this battery to last 4 or 5 times longer than ordinary batteries.

Like most car owners, I wondered why batteries hadn't been improved more since the days of the Model "T". First I found the answer to this problem and then I did something about it. My own belief was that many new battery improvements died on the drawing boards because of the widespread fear that they would make batteries cost too much and the belief that batteries which would last five years or more would upset part of the battery market.

The Secret of Building A Better Battery

Basically, there are only three ways to put more power into a battery:

1. Use a different metal for the plates.
2. Make the plates bigger.
3. Speed up the circulation of the electrolyte.

In my search for the ideal plate material, I reviewed everything that had been tried since Volta's original battery in 1801, including Ritter's gold-ammonia battery and Gautherot's platinum plate design invented over 150 years ago, besides plates now used in European batteries.

Working with metallurgists who had pioneered a method of increasing plate density, I decided on an alloy now known as the "neutronic" plate which combined high power output with exceptional resistance to sulfation—assuring vastly increased life.

But the big problem—the weak link that had held back battery design for many years—was the insulator that kept the plates apart. When the insulators broke down under heat and acid, the battery was doomed.

The answer, I found, was a porous synthetic insulator. Tests proved it was completely unaffected by acid, and so perfect an insulating material that it could be made considerably thinner. This left more room for plates—and thicker plates meant more power.

Moreover, the porous synthetic insulators let the electrolyte circulate more freely, keeping the battery

(ADVERTISEMENT)

cooler. This last point was actually the most important of all, because internal heat is a main cause of battery failure.

Five of our early experimental batteries were put through S.A.E tests. They were completely run down and charged, run down and charged from 604 to 1142 times for an average of 753 lives. I knew then I had a battery which could outsell anything else on the market — if I could get it on the market!

Free Advice Didn't Help

Well, I had lots of free advice from well meaning friends. Typical remarks were: "You can never market your battery even if it is better unless you have a million dollars; the big companies will run you out of business in six months; why should anyone pay more for an unknown battery even if it is guaranteed for six years?" It's a good thing I'm a hard-headed Dutchman because this just made me work harder to make my dream come true.

Let me say right now that I've had no trouble with big battery manufacturers; in fact, one of the biggest on the West Coast has helped me all along the way.

As it developed, I had plenty of time to work out production problems because of wartime and postwar shortages.

By the time I shipped the first few hundred batteries to Alaska and Venezuela for arctic and tropical field testing in 1952, one of the original *Life-Time* batteries had already lasted eleven years (and it is still in use today)!

Automotive, Scientific Editors Torture-Test the Life-Time Battery

When the word got around that the *Life-Time* battery had survived rugged field tests in the 40-65 below Arctic winter and the 100-plus Venezuelan summer, technical writers and editors started coming in to ask questions.

"Why do you call it the *Life-Time* battery?"

"*Life* because of its power, *Time* because of the time it will last."

"How long will it last?"

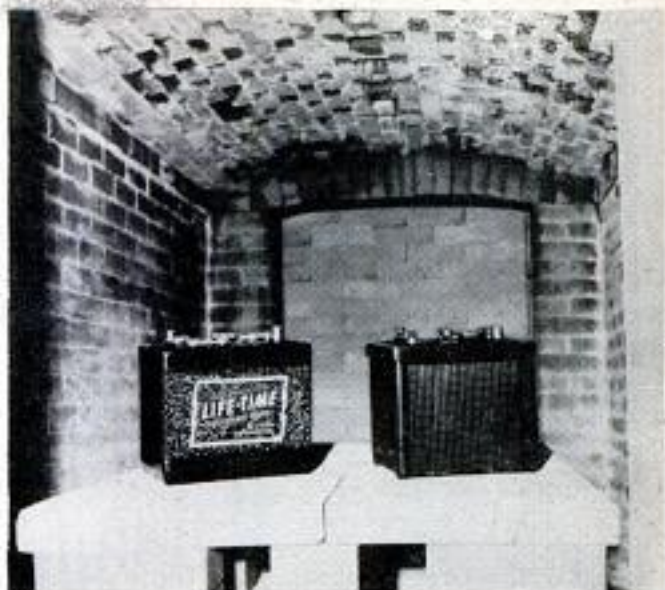
"I don't know. Ask me again in another fifteen years. I'm guaranteeing it for six years because that's a conservative figure."

When they got into technical questions about the *Life-Time* battery's construction and performance, I had just one answer: "Take a battery, test it any way you like, tear it apart if you want to."

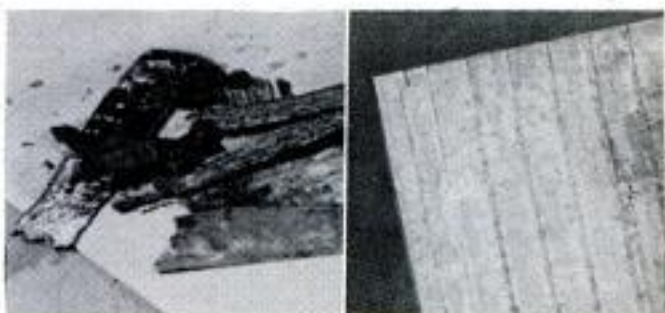
After that, things happened fast. The editors of *Motor Trend* magazine tested the *Life-Time* battery against two of the best-known high-quality brands, rated the *Life-Time* "outstanding... has unprecedented life expectancy."

Others editors and researchers did about everything, as one writer commented, "but throw bricks at the *Life-Time* battery trying to make it give up."

Dozens of articles were written about the *Life-Time* battery; you may have read some of them in *True*, *Popular Science*, *Motor Life*, *Argosy* and others.



Twin-battery bake oven test demonstrates how ordinary batteries fail when heat causes insulators to break down, plates to buckle. Improved design keeps *Life-Time* battery cooler, increasing power and life by maintaining higher water level.



Insulator at left was taken from a popular brand battery after one year, destroyed by heat and acid. *Life-Time* insulator at right was taken from a battery after five years of service.

The Experts Were Satisfied —But I Wasn't

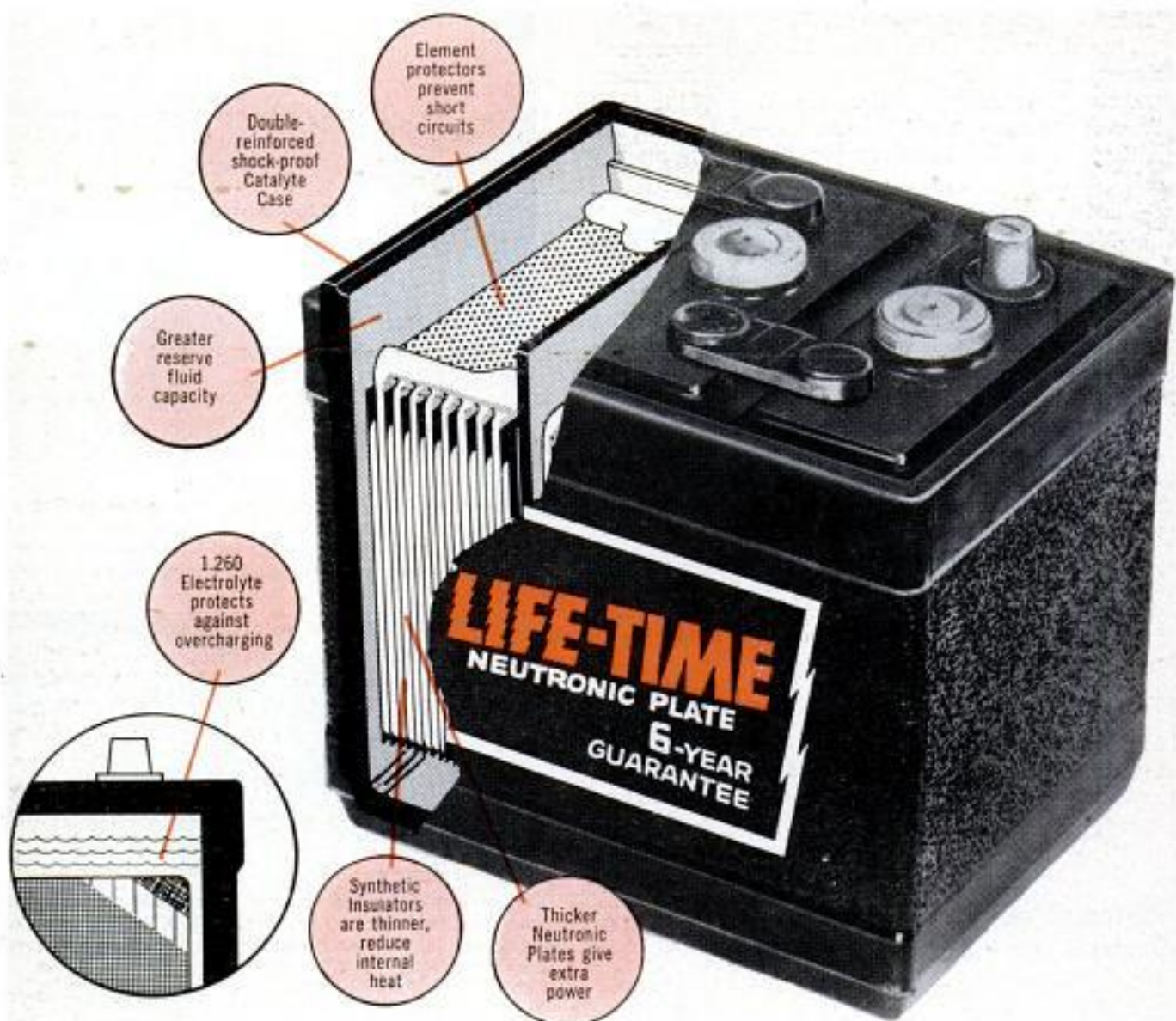
Probably I shouldn't admit that I'm still not satisfied with the *Life-Time* battery, but it's true. Recently, for example, we started adding Tellurium to our grid metal.

Technically, it is a fascinating metal — if you can get excited about facts like these: "... atomic number 52, atomic weight 127.5; 3 isotopes, atomic weights 126, 128, 130... hexagonal-rhombohedral prisms, isomorphous with stable grey selenium..."

All you really need to know about Tellurium (actually, you could probably live without this information, too) is that it was discovered in 1798 in a specimen of gold ore from Austria, but nobody could find a use for it for over 150 years. Now we use it to further increase the life of *Life-Time* batteries. How much will it add to the life of our battery? Ask me again in 15 years or so. By then, our laboratories will have made still more improvements.



For construction details of *Life-Time* battery, turn page.



Diagrams show how thick insulators in ordinary batteries leave less room for plates. Insulators used in Life-Time batteries are thinner, making it possible to use thicker plates for more power. These porous plastic insulators permit acid to circulate freely, keeping internal heat down, increasing life.



Advice to Inventors: Don't Worry About Imitators

Naturally, the success of the *Life-Time* battery has attracted imitators to the field. By using names similar to *Life-Time*, they hope some of our success will rub off on them. Fortunately, they can't duplicate our battery, which is the only thing that counts. Their competition hasn't hurt us — it never hurts a superior product.

6-Year Guarantee Backed by Multi-Million Dollar Bonding Company

At first, I considered guaranteeing the *Life-Time* battery "for the life of the car." But since industry figures showed that the average life of a car in the hands of one owner — which is the way "life of car" guarantees are set up — was only three years, I felt I could go stronger than that. I guaranteed the *Life-Time* battery for six years — regardless of how many cars you use it in.

Although I feel six years is a conservative figure — well within the life expectancy of the *Life-Time* battery — I asked one of the world's largest companies if they

(ADVERTISEMENT)



Millions read about the Life-Time battery in national magazines; millions more hear about it on network radio and TV broadcasts of international sporting events, including the Indianapolis "500" classic and Pan American Road Race.

Dealers and Distributors Needed to Fill Orders

Life-Time batteries are now rolling out of four plants, with two more scheduled to start producing this year.

If you have a retail store, such as a gas station or garage, and would like to fill the orders that come in from 4-page ads like this, plus network radio and TV broadcasts, fill out the Dealer Information Request at the bottom of this column and mail it to us.

If you have facilities for warehousing and delivering batteries and other automotive products to our growing dealer organization, write us for information about distributor franchises. These distributor franchises are not sold to anyone; the only capital required is for merchandise inventory. Write:

Continental Manufacturing Corp., Dept. PM-6
Washington Blvd. at Motor Avenue
Culver City, California

Dealer Information Request

Continental Manufacturing Corporation, Dept. PM-6
Washington Blvd. at Motor Avenue, Culver City, Calif.

Gentlemen:

I have a retail business and am interested in filling orders here for Life-Time batteries. Please rush me complete information about a dealership.

Name _____

Address _____

City _____ Zone _____ State _____

would back the six-year guarantee with a bond. After a thorough investigation, they agreed that six years was a conservative figure and issued the bond — the first and only time such a bond had ever been written.

One Price For All Cars

Most batteries cost more for, say, a Cadillac or Lincoln than for a Chevrolet or a Ford. This, I feel, is unnecessarily confusing to the public — the dealers who have to keep the customer waiting while they look up prices. By setting just one price for all sizes, we were able to eliminate so much needless waiting that we could absorb the cost of our new battery models. The full price of the Life-Time battery is \$29.95 for any six-volt size, which includes light trucks as well as passenger cars. All 12-volt sizes are \$34.95. In addition, we make batteries for all farm, marine and industrial uses.

Order by Mail; Your Dealer Will Deliver

Since this is about the largest battery ad ever run, I want to try something new. I'm not interested in selling batteries by mail in competition with our 10,000 dealers, but I can do this, if you would like to order a Life-Time battery right now without going to the trouble of looking for "your nearest dealer," as they say in the ads.

Just fill in the order form at the bottom of this page; we'll have your nearest dealer install your Life-Time battery. Tell us the make, model and year of your car, enclose \$29.95 for any six-volt size, \$34.95 for any 12-volt size, or enclose only \$5 deposit, pay balance when delivered.

Here's what you get for your money: first, higher amperage, which means more power for starting, lights and accessories; second, savings on battery replacements which can amount to about the price of a set of tires over the Life-Time 6-year guarantee period.

Incidentally, here's a tip about buying a battery — any battery. The best time is in Spring or Summer, because the driving you do in warm weather actually "breaks in" your battery for the cold weather ahead.

Continental Manufacturing Corporation, Dept. PM-6
Washington Blvd. at Motor Avenue, Culver City, Calif.

Gentlemen:

Please have my nearest dealer or warehouse install a Life-Time battery in my

Make, model, year of car or truck _____

I enclose () \$29.95 for 6-volt () \$34.95 for 12-volt;
there will be no charge for shipping or handling.

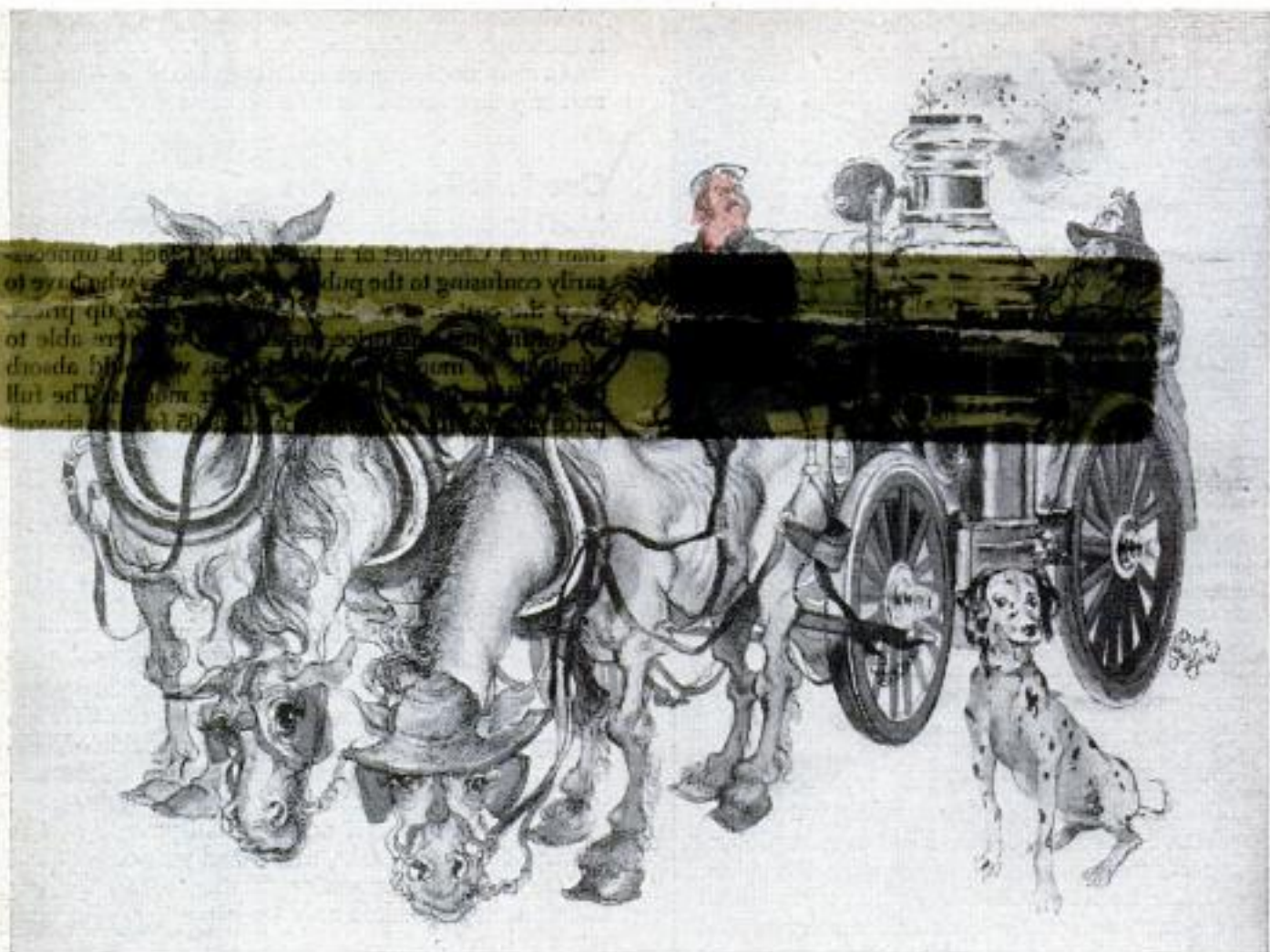
I enclose () \$5 deposit, will pay balance on arrival.

Name _____

Address _____

City _____ Zone _____ State _____

© 1954



LOST HORSEPOWER can be dangerous...and costly!

When bells clang and sirens scream, you know that the fire engines in your community are on their way...and you're proud of that equipment, because it's ready to meet any emergency with full, responsive horsepower!

You'll be proud, too, of the full, responsive horsepower in your automobile engine that is equipped with Perfect Circle 2-in-1 Chrome Piston Rings. For 2-in-1 gives sustained power and oil economy for *over twice as long* as old style rings. In the 2-in-1 Set, both the top ring and the oil ring rails are plated with thick, solid chrome, giving complete wear protection throughout the entire area of ring travel.

Install Perfect Circle's 2-in-1 Chrome Rings and you'll enjoy improved performance and lasting oil economy! Perfect Circle Corporation, Hagerstown, Indiana; The Perfect Circle Co., Ltd., Toronto, Ontario.

Perfect Circle
2 in 1 chrome piston rings
THE STANDARD OF COMPARISON



Solid chrome plating on both top and bottom rings gives complete wear protection throughout entire area of ring travel. Rings are lapped-in at factory, making tedious break-in unnecessary.



Brawny axmen chip away four cords of wood to cut the falling notch in a giant sequoia towering 300 feet high

WHEN THE GIANTS FELL

By J. R. Challacombe

*1495 Easterday Terrace
Los Angeles 26, Calif.*

FIFTY YEARS AGO America was in the steam age and everyone was suddenly doing improbable and impossible feats. Houdini escaped from locked safes and the Wright brothers were flying.

In the California Sierra Nevada mountains, big-shouldered woodsmen, bursting with Yankee ingenuity, were felling and logging with primitive hand tools and the first donkey steam engines a forest of the largest, oldest, heaviest trees in the world.

The giant sequoias—also known as Cali-

fornia big trees—have massive trunks, 20 to 30 feet in diameter at the ground, 250 to 300 feet high, and weigh 1000 to 1500 tons—sometimes a whopping 2000 tons! They are redwoods related to the ordinary commercial redwood, but much thicker in the trunk and older—a few being 3000 to 4000 years old.

The lumbering of the Converse Basin forest of sequoias was the first and only full-scale lumbering of these greatest of trees. And, while the wholesale felling of



Donkey steam engine was the workhorse. Mounted on skids, it reeled in cable to pull itself up the mountains

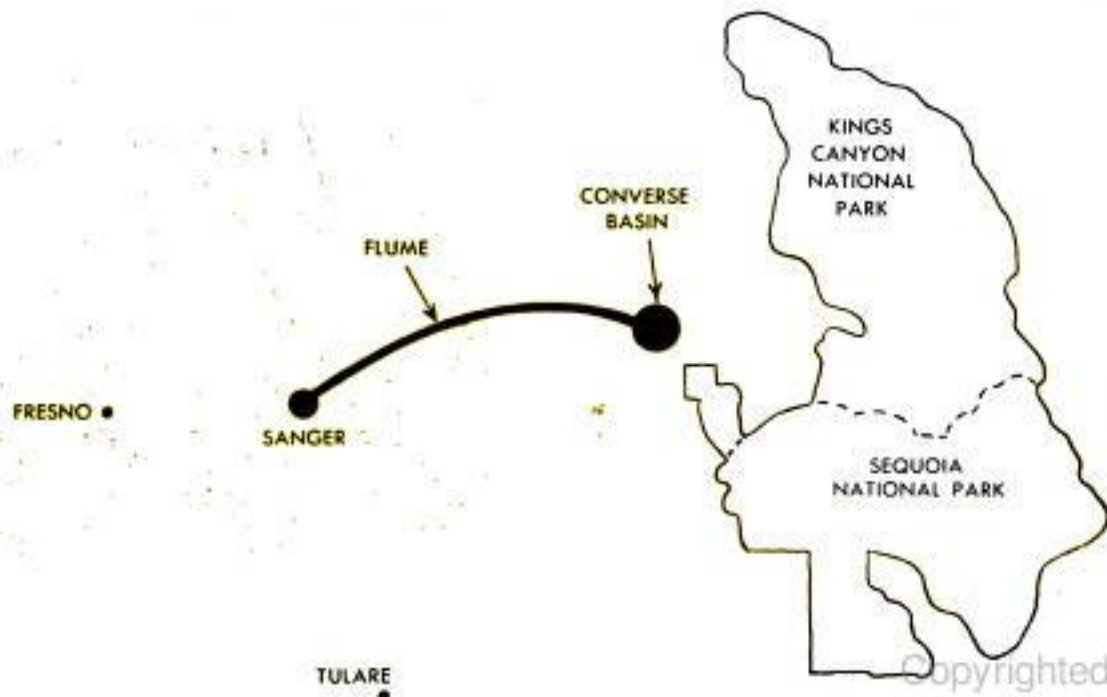
this one grand big-tree forest—the largest in the Sierras—was a real national tragedy, it did spur logging interest in protecting the other sequoia forests. Today it offers us a fascinating spectacle of man's monumental inventiveness.

To fell these Gargantuan trees with ax, saw and wedges, to handle the 100 to 150-ton logs on the precipitous mountainsides, and to ship a paying quantity of lumber out of the rugged, roadless Sierra wilderness were problems that should have made the lumbermen give up before they started. Only the tremendous board footage represented by each sequoia trunk

(250,000 to 400,000) kept them eagerly devising stratagems to overcome difficulties.

The scheme of felling a big tree was the same as for most smaller trees; only to fell a 300-foot tree with a massive trunk 25 feet through, the hand labor and risks were magnified enormously. To make the horizontal undercut, some 500 cubic feet or four cords of wood had to be chopped out, chip by chip. To make the sawcut in from the opposite side, a limber, 22-foot ribbon of toothed steel had to be drawn slowly back and forth, straight across the trunk, until it sank through the wet wood to the center of the butt. After days of work, only

Converse Basin; where the big trees were felled, is a relatively small area. You can find the tremendous stumps today. Logs were milled at Converse Basin and the lumber roared down the ingenious flume to Sanger





In this one log there was more than enough lumber to build a house! It was rolled onto chute line at left

a strip of wood near the center was left uncut to act as a hinge, and the felling wedges were started into the sawcut. To tip the 1500-ton dead weight the men had to sledge endlessly on the ringing, quivering steel. Each blow of the 12-pound hammer was transformed by the slope of the thin wedge (18 inches long and barely $1\frac{1}{2}$ inches thick at the head) into a minute upward movement, and it must have taken tens of thousands of blows on each of the many wedges protruding from the sawcut to unseat the giant. In addition, the big tree, often leaning and unwieldy with limbs at odd angles, had to be maneuvered with wedges to fall precisely on the area that had been cleared and leveled. The least unevenness of the ground would shatter the ponderous, brittle trunk as though it were glass. Felling other forest trees was almost like hacking down a sapling compared with the calculations, sweat and brawn needed to put a big tree down exactly on its prepared falling bed.

The men who were responsible for the earthquaking crashes of the big trees were enormously proud of their skills with their oversize axes and saws. The work in the giant timber was for big, free-swinging men who could work an 11-hour day for six days a week, chop right or left-handed, fetch a big chip from the undercut with each ax blow, not miss a stroke on the long saw and hammer for hours on the wedges. Relaxing on Sundays, these men hunted, fished, gambled, played baseball in the

few meadows and had uproarious fist fights following loud bragging over who was the better man with both ax and fists.

Once on the ground, the sequoia trunks appeared mountainous. After the loggers sawed them into 20-foot logs, the crews with the donkey engines took over. Mounted on skids, the Dolbeer steam donkey

Crosscut saw for the big trees was a long ribbon of steel made by welding two ordinary saws end to end

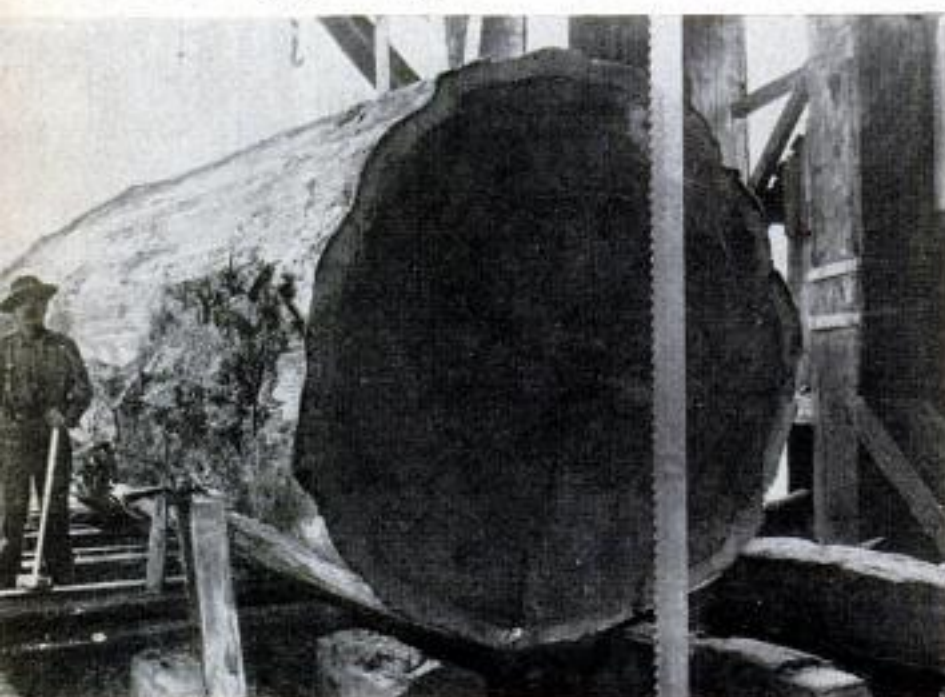




This was a big moment—the arrival of two new “donkeys.” Their cables were snagged around stumps and the donkeys pulled themselves off cars



Tiny figures on last log show two of the biggest daredevils in a land of daredevils. These men rode the screeching log trains down the chute to the mill. Sparks flew and smoke billowed up from the greased chute. Below, special log-splitter bandsaw had a blade 90 feet long



could pull itself into almost any position. One old-timer told of getting up a head of steam, putting out the fire and riding the engine up a cliff! Pulling on blocks and tackles, the Dolbeers chugged and puffed and rolled the huge sequoia logs into the chute lines.

Fifty years ago in the big mountains there were no highways for logging trucks or extensive mountain rail lines, but the giant logs still had to be moved in quantity over the rocky, steep terrain into the mill. And move they did in the ingenious log-chute system. A chute was essentially a continuous line of parallel timbers, each 18 inches thick, and set about 18 inches apart; the tops were hewn flat and slanted inward to cradle the logs. These chutes were embedded in the ground, laid on notched cross logs or run on high log trestles. Feeder chutes switched into other chutes and these into the main-line chutes, so that the whole basin was drained by a network that ended at the mill. Large donkey engines were stationed at strategic points and pulled the logs down the chutes into the main lines where great 200 and 300-foot trains of sequoia, pine and fir logs bound for the mill were assembled. A heavy 1¼-inch steel cable was fastened to the last log; telegraphic bell signals to the mill were given; and the bull donkey began to draw the train in from the woods.

Wherever the main line chutes curved, upright oaken rollers were positioned and braced in the arc of the curve to keep the cable from cutting into the mountainside. Likewise, over a brow, rollers were fitted between the chute timbers. The strains on the chutes from the friction of wood on wood and from the weight of the log trains were immense. Crews of “chute greasers” were constantly swabbing the log rails with animal grease, and



Village around the lumber mill housed the rip-roaring woodsmen. Tramway at left hauled lumber to the flume

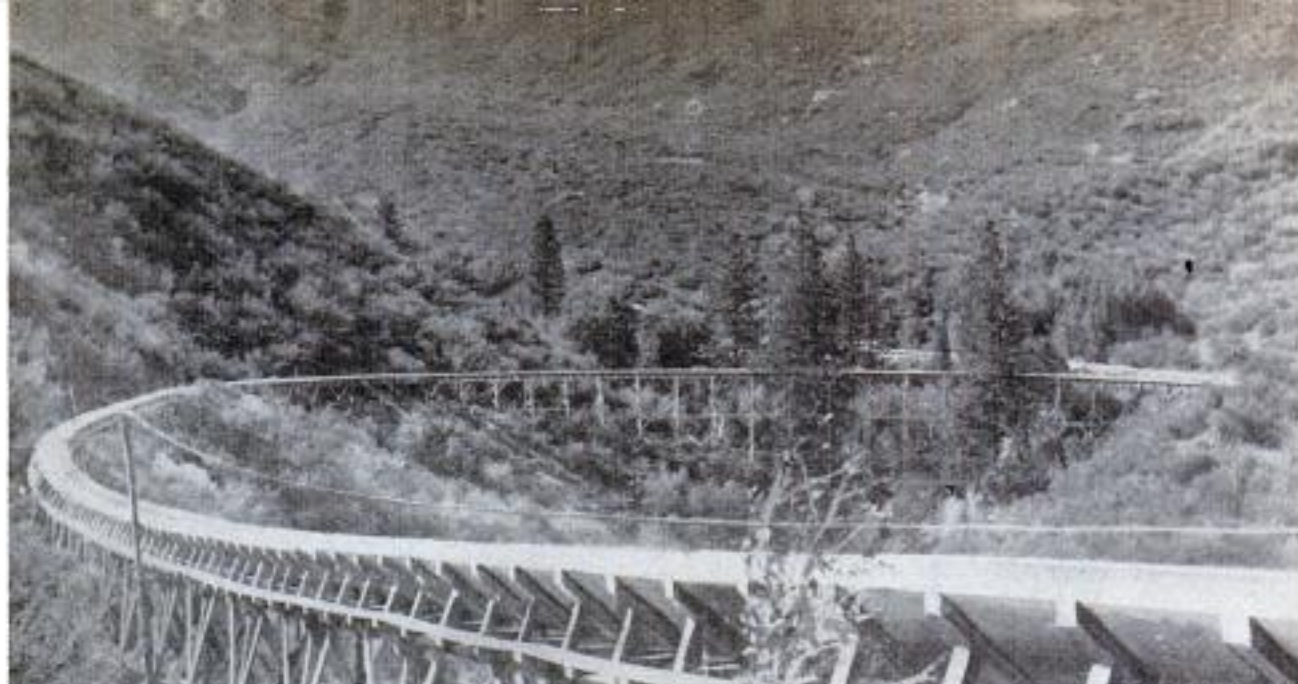
in the evening the chutes had to be inspected for possible fires started by the day's log trains. The designing and construction of the chutes, like the felling of the giants, was a high woodsman's art. The curve of the chutes, the interlocking notches of the underpinnings, the setting of the rollers, all were calculated by shrewd eyes without

the assistance of engineers and transits.

The "conductor" of the log train warned the donkey man of impending trouble. He rode the last pusher log amidst clouds of smoke and sparks billowing from under the soft redwood logs, and was the daredevil of the woods, his recklessness highly admired by the fellers, loggers and millmen.

Village belles pose on the Shay locomotive that pulled cars to the drying yard and the head of the flume





Bill Heidorn photo

Flume was an engineering masterpiece, a manmade river channel. Gush of water carried lumber 54 miles

The trains came in as fast as possible and any one of a hundred possible accidents could kill the rider outright. Mainly his footing depended on the donkey man's ability, through the feel of his clutch levers and his huge engine, to keep the reluctant train sliding evenly, up grade and down, on the hot, grabbing rails. If the rider foresaw a jam he could signal by shorting the two bare telegraph wires along the chute with his metal-tipped pole.

Once safely at the mill, the rider piled the chains, cables and "dogs" used to bind the train into his "chute boat"—a hollowed, canoe-like log—and hooked it to the back-line cable for the more hazardous return trip.

The miles of steel cable flung out into the

mountains to manage the big logs were cunningly arranged. From two of the bull-donkey's huge drums, cables went out into the woods. One was the heavy main line that came around the steep edge of the mountain. The other was the longer, smaller back line that ran directly over the mountain—hanging from blocks on trees—to the end of the chute and then along it into the landing. The back line was dragged in with the train and it pulled the main cable, the "boat" and the rider back into the woods.

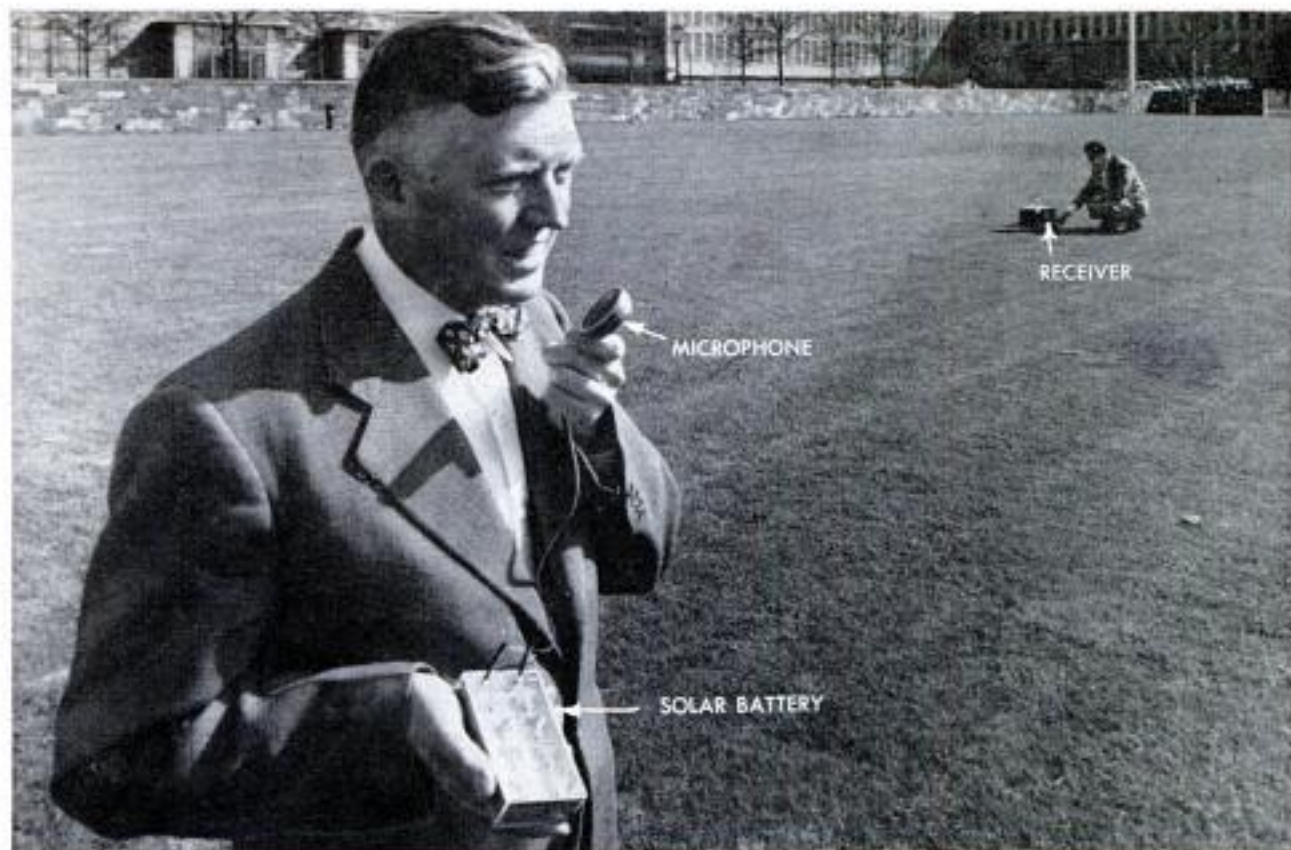
As the bull-donkey operator, each hand on a lever, skillfully slackened on the main cable and drew in the back line, the daredevil of the woods, riding his "chute boat" like a surfboard, shot over the rises and around the curves back into the uncut forest. At each curve he had to jump at the right moment, for the main cable without warning whipped across the boat like a boom. Balancing in his careening "boat," chewing tobacco, reveling in thoughts of the week end while nonchalantly skipping the deadly cable, the chute-rider was a new breed of machine-age man in turn-of-the-century America. He risked his life on the donkey operator's sensitive mastery of the ungainly powerful engine and the long, snapping cables.

The mill located at Converse Basin had a huge

(Continued to page 234)

In the drying yard, lumber was piled into a "square log" which was held together by hooked iron clamps, lower right, for ride down the flume





Solar battery powers pocket radio transmitter in demonstration. Some broadcasts have carried several miles

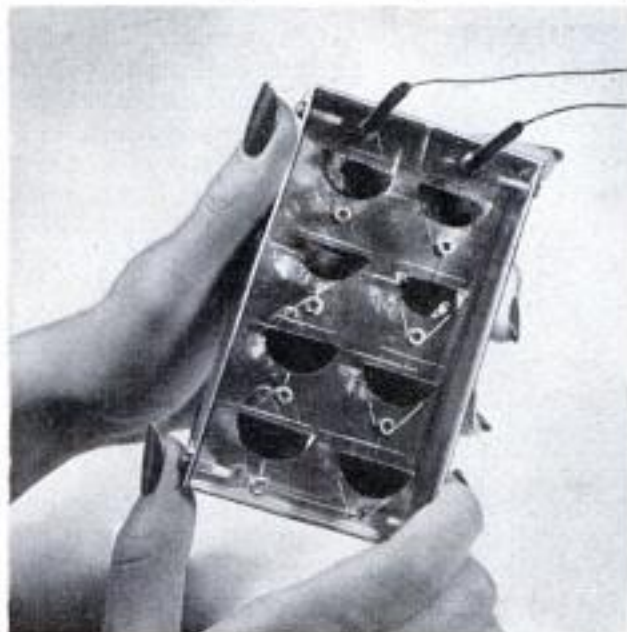
Solar Battery Turns Sunshine Into Usable Electric Power

RADIO TRANSMITTERS and telephones powered by the sun result from the latest development at Bell Telephone Laboratories—a solar battery. According to Bell, it's the first successful device to convert useful amounts of the sun's energy directly and efficiently into electricity. Conversion is accomplished by strips of specially prepared silicon about the size of razor blades,

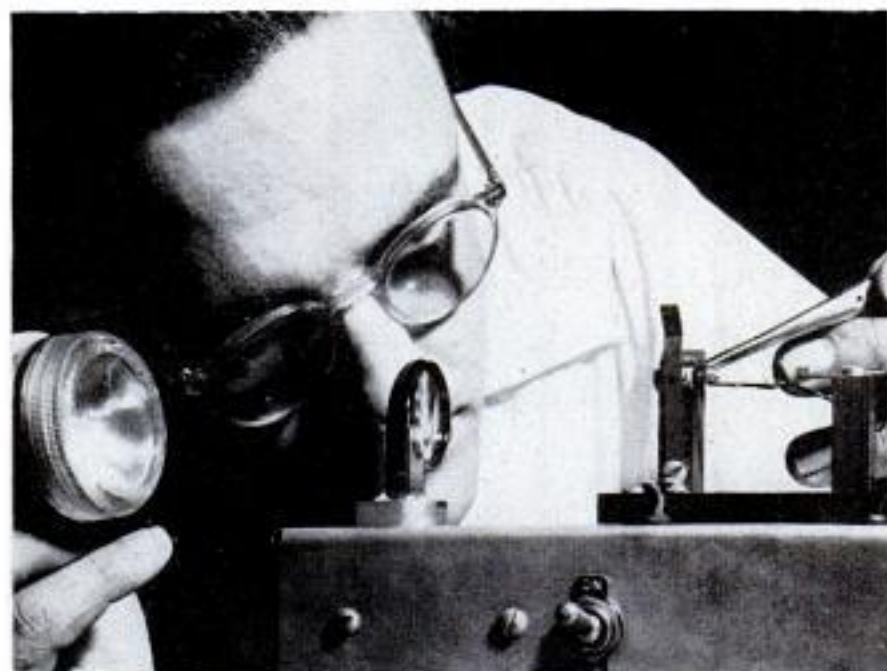
Battery contains silicon strips which change light into usable energy. It has six percent efficiency

contained in the transparent case of the unit. In tests, the battery has achieved a six percent efficiency, which compares favorably with the efficiency of steam and gasoline engines. Previous photoelectric devices have never rated higher than one percent. Solar batteries may eventually be used to power radiotelephones and charge batteries for rural telephone systems.

Sunlight provides the power to turn this motor-driven wheel at Bell laboratories. Many uses are forecast



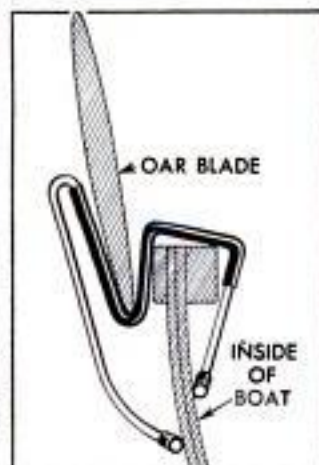
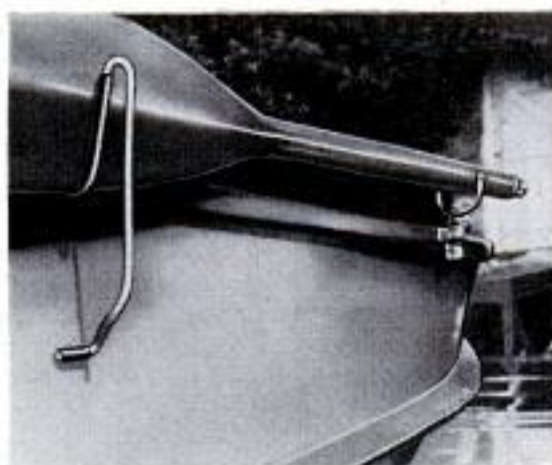
Bean-Size Electric Eye Is More Sensitive Than Large Photocell



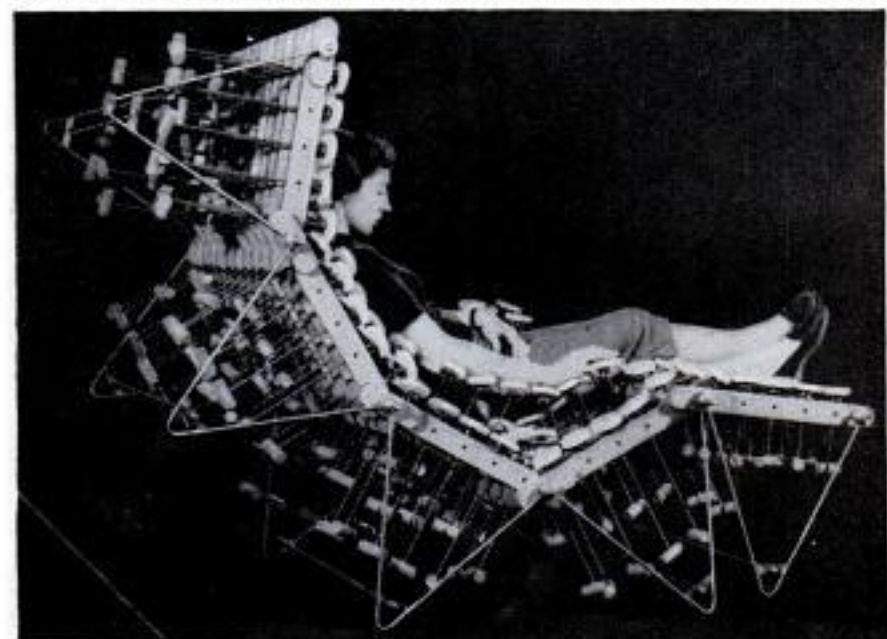
About the size of a bean, a new germanium photocell is more sensitive to light than conventional electric eyes which are a hundred times larger. The miniature eye is a little cartridge containing a germanium wafer and a glass lens. Because of its comparatively large power output, the photocell is suitable for operating relays directly in controlling many production processes. Possible applications include the regulation of heating devices and the searching out of industrial targets for guided missiles.

Reversible Clamp Holds Oars and Equipment Inside or Outside Boat

Oars are held securely out of the way and out of the water by a clamp-on oar rest that fits any type of gunwale. It can also be reversed to hold trolling rods, bait buckets, fish bags and other equipment on the inside of the boat. The oar rest is made of spring-tempered aluminum and is partially covered with rubber. It requires no bolts, screws or other fittings.

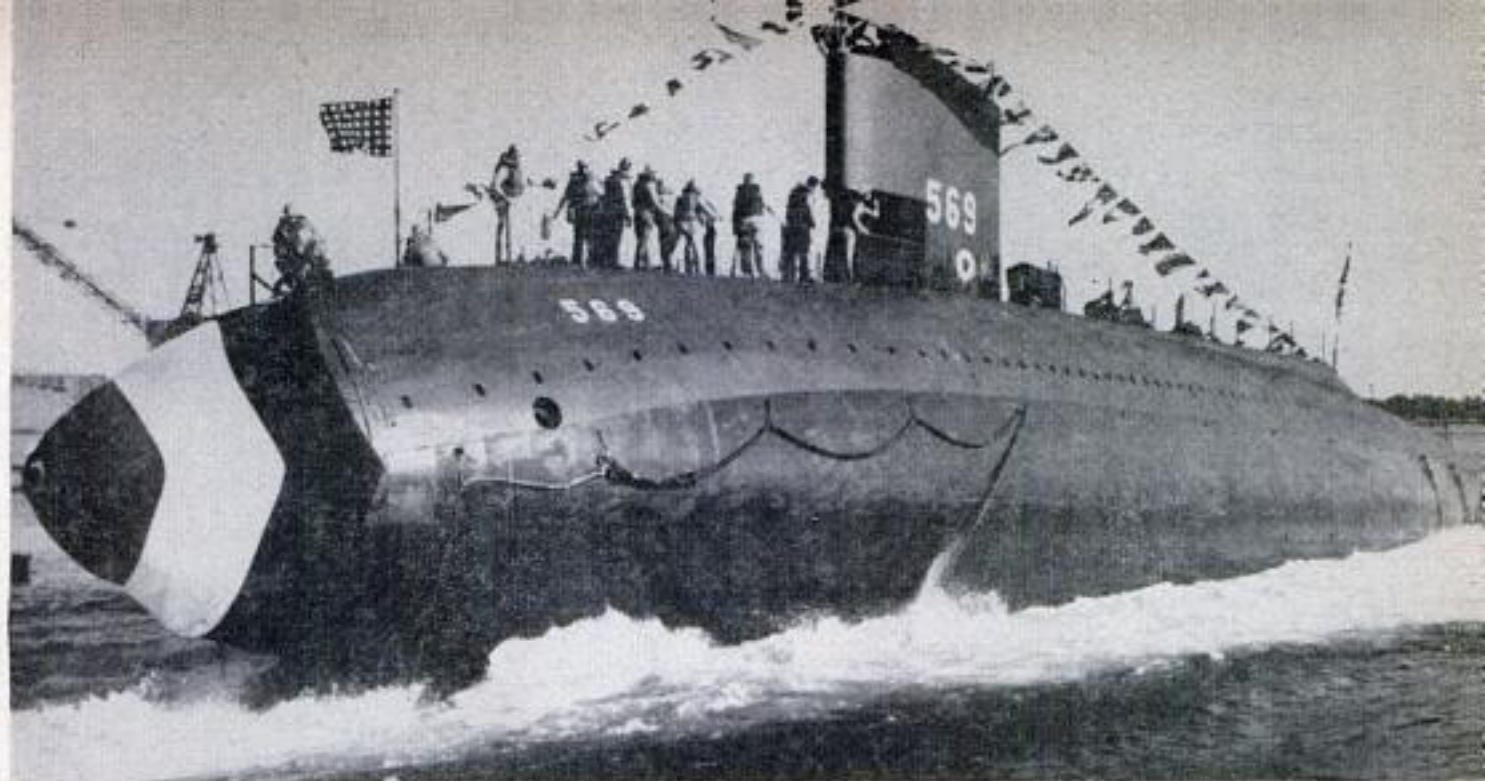


Contour Delineator Used in Research Adjusts to Fit Subject's Body



As a person sits in a "contour delineator" at Illinois Tech's Institute of Design, researchers adjust an array of disks mounted on long wire handles to form a "chair" around him. The new tool is used for testing dimensions, postures and pressures. It assists research technicians in designing new and more comfortable furniture.

ⓂNorwegian chemists have produced a protein plastic made from fish which is easy to machine, transparent and glossy.



Albacore was launched last year and completed this spring. It will be used by Navy for experimental purposes

Streamlined Sub Sets Underwater Speed Records

STREAMLINED DESIGN helps to give the newly completed USS *Albacore* the fastest submerged speed of any diesel-electric submarine operating in the United States Navy. The hull form, evolved in wind-tunnel tests, requires less than half the shaft horsepower of the small Guppy submarine to make the same submerged speed. Less surface area is exposed than in conventional submarines, and all cross sections are as nearly circular as possible.

The small, fast, maneuverable vessel is controlled like an airplane, using a stick

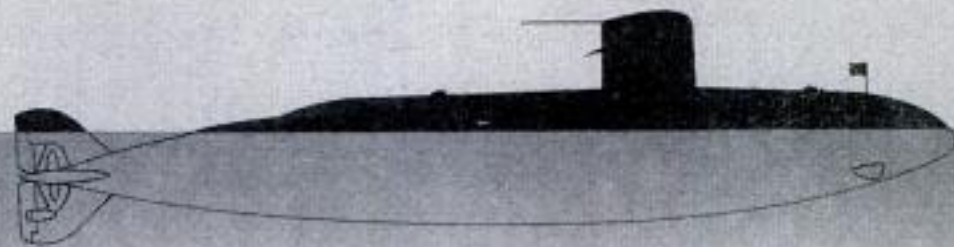
control with the steering wheel at the top of the stick. It can be controlled by one, two or three men. When two or three men control the ship, one man steers while one or two men control the depth.

Experimental in nature, the ship will be used to make realistic full-scale tests of advanced technological possibilities. It resulted from a need for a modern submarine that could make unusually high underwater speeds with much better maneuverability than the fleet type. A conventional diesel-electric power plant is used.

Albacore is shorter, lower in the water and exposes less surface area than conventional fleet type of submarine

Official United States Navy drawing

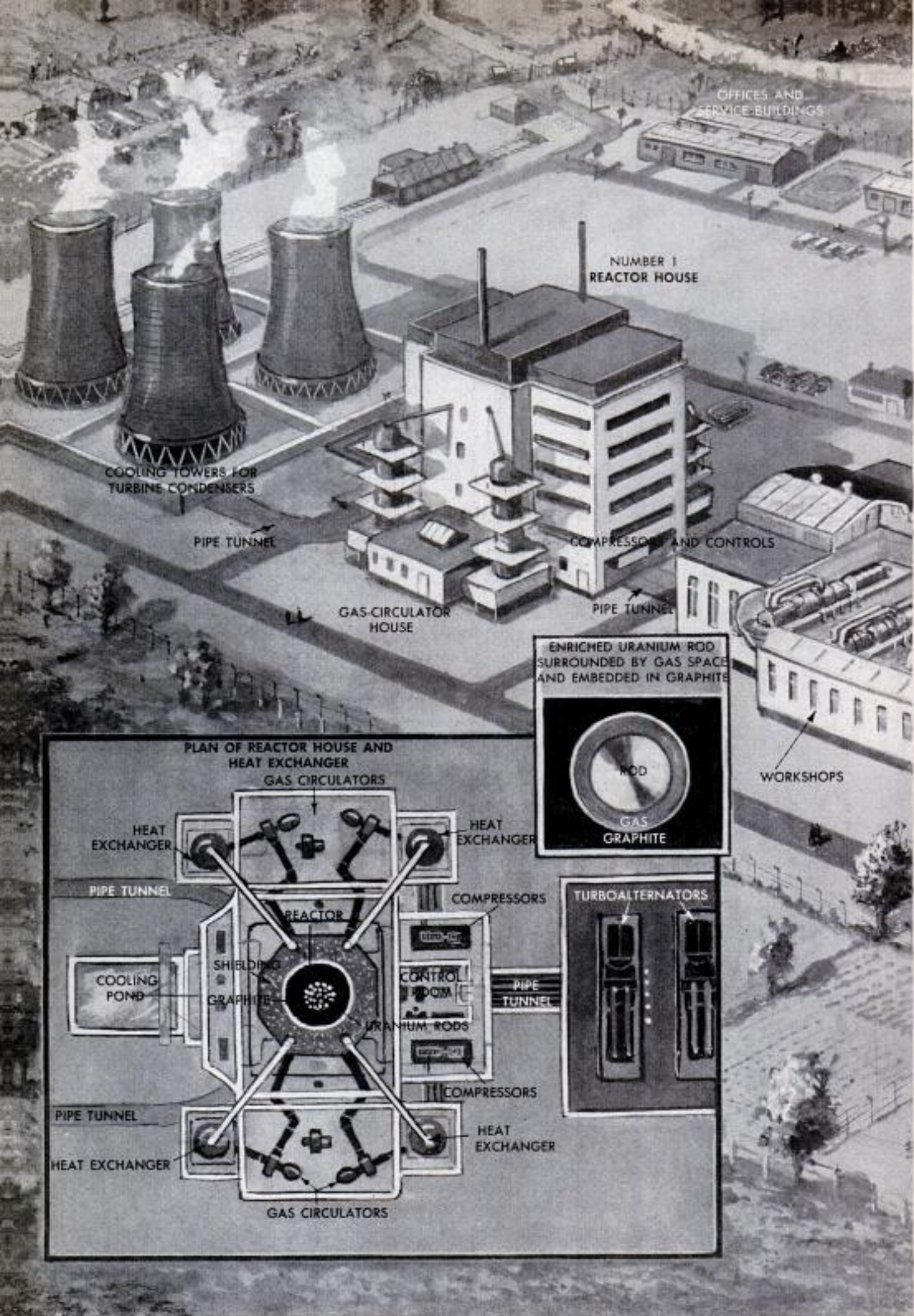
USS ALBACORE

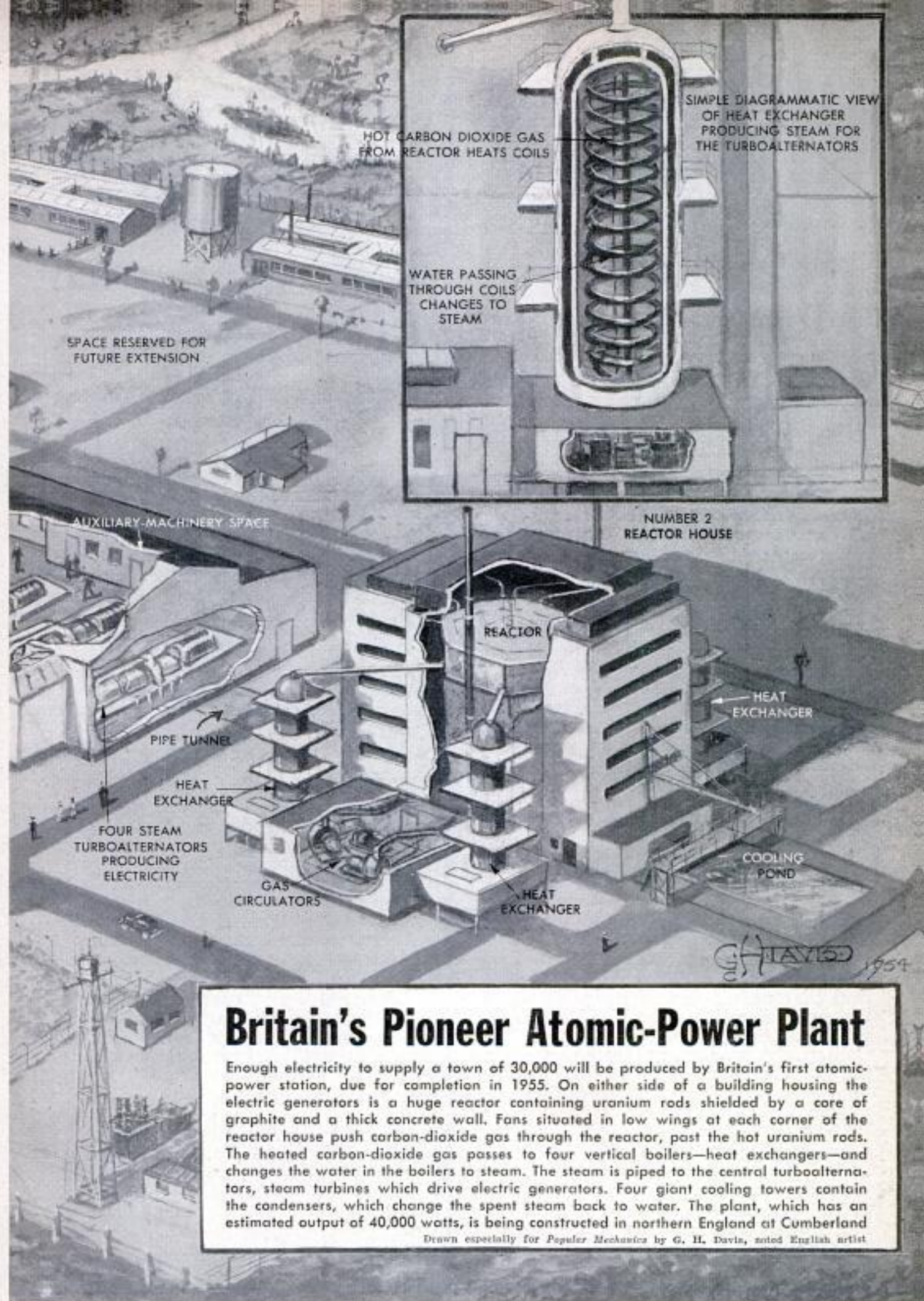


WORLD WAR II FLEET TYPE



Copyrighted material





Britain's Pioneer Atomic-Power Plant

Enough electricity to supply a town of 30,000 will be produced by Britain's first atomic-power station, due for completion in 1955. On either side of a building housing the electric generators is a huge reactor containing uranium rods shielded by a core of graphite and a thick concrete wall. Fans situated in low wings at each corner of the reactor house push carbon-dioxide gas through the reactor, past the hot uranium rods. The heated carbon-dioxide gas passes to four vertical boilers—heat exchangers—and changes the water in the boilers to steam. The steam is piped to the central turboalternators, steam turbines which drive electric generators. Four giant cooling towers contain the condensers, which change the spent steam back to water. The plant, which has an estimated output of 40,000 watts, is being constructed in northern England at Cumberland

Drawn especially for Popular Mechanics by G. H. Davis, noted English artist

Detroit Listening Post



By Leo Donovan

YOU DON'T HAVE to listen carefully to sense that things are stirring in Detroit. There's an exciting year ahead. The attitude of all but the biggest is that it's going to be a fight to "Stay Alive in '55."

Chrysler's complete line—Chrysler, DeSoto, Dodge and Plymouth—will have new, lower and more attractive bodies. Plus a new engine for Plymouth. It will be the first complete car that the "new blood" at Chrysler has offered. Styling by Exner (of postwar Studebaker fame) will end once and for all (Chrysler hopes) any complaint that Chrysler's designing is dowdy.

Chevrolet, informed sources insist, will also be completely redesigned and repowered. Pontiac, too, will share in General Motors' plans for alternate redesign on a three-one-year and two-the-next schedule.

Ford, of course, has been working on an all-new 1955 body for several years.

It's a great year coming and one of intense competition. Hold on to your hats!

Price Cuts for 1955?

The impression grows here in Detroit that price reductions will accompany introduction of the 1955 models. Incidentally, rumor says one auto maker was visited by a group of dealers who demanded that factory prices be cut \$200 on 1954 models.

Detroit has been invaded by a California firm that makes superchargers. Most of the auto companies have bought some of the highly improved devices for tests. The Californians, who market their product in the sports-car and custom-car field, are hoping that Detroit will put them on regular production models.

The 1954 Kaisers have the new superchargers as standard in the Manhattan series. They increase horsepower on demand by as much as 30 percent.

Engineers answer the charge that the horsepower race is dangerous by saying that the added power provides very little more top speed and that the benefits are principally in the lower driving ranges where acceleration is needed for passing.

The supercharger advocates claim that such extra bursts of speed can be provided by a blower without the expense of the more powerful engine and its increased gasoline consumption.

The supercharger, as used on the Kaiser, comes into play only on demand—when the throttle is opened wide. This keeps gasoline consumption down.

One of the Big Three is rumored to be considering dropping the disk brake. According to engineering gossip, the company will make its own brakes to meet specifications on a new single-piece brake shoe.

Wiping the Wrap-Around Windshield

Auxiliary windshield wipers for the wrap-around windshield will probably be an accessory of the near future. Something has to be done to clean the corners now left untouched.

Twin electric motors will operate two pairs of wipers—one pair of large blades for forward vision and another pair of smaller blades for cleaning the curved areas that are blind spots.

But here is what L. H. Middleton, engineering vice-president of the Electric Auto-Lite Co., said about the problem:

"We are busy working on some of the darnedest-looking contraptions to take the ice and slush off the windshield. The final solution is not going to be by wig-wagging a piece of rubber across it. High-pressure hydraulics will be used."

Hydraulic Car Doors

Middleton also said that with power accessories coming into widespread use, the industry will soon be turning to a single hydraulic power source. Engineers have in mind a hydraulic pump with pressures up to 1500 pounds per square inch. It won't be any larger than a grapefruit and it will provide the hydraulic pressure to raise and lower seats, windows, top, hood and trunk lid. It will lock all doors at once with one control without mechanical latches.

Car doors, instead of opening on hinges as house doors do, will be swung into the roof, rolled under the floor or made to slide in two halves. With hydraulic pressure, you can move anything, anywhere.

With a central hydraulic source, power window lifts would be no more expensive than the present wind-them-up variety.

Middleton maintained once again that the six-volt ignition system can do everything a 12-volt system can. Even though the entire General Motors lineup of cars will be 12-volt equipped in 1955, he said, the 12-volt system is not essential.

"We demonstrated that by using our 6-volt system on the highest-compression V8 in production today," he stated.



Robert H. Forbes photo

Gull-Wing Airplane for Farm Use Gives Pilot Better Vision

Specially designed for spraying, dusting and seeding, a new slow-speed agricultural airplane carries loads of more than 2500 pounds. It has a gulled center-wing section, with flight instruments mounted along the trailing edge, permitting the pilot better forward visibility and allowing him to

watch the instruments without looking down into the cockpit. The aft end of the fuselage is open for easy cleaning. The Air Tractor's cruising speed of 75 miles per hour allows good ground coverage from altitudes of 30 to 40 feet, instead of lower heights required in some older craft.

Modern Styling on Camera Combines Looks and Utility



Streamlined and simplified in operation, an inexpensive camera has been styled by Raymond Loewy to combine beauty with practicality. Even its color has been considered, the metal camera body being two-tone gray and silver with accents of

red. There are several mechanical innovations in the new design. A shutter lock prevents double exposures and the sliding lens cover is also the front section of the light shield of the twin-lens reflex. The film winding is done by ratchet action with a large easy-to-operate knob. The ground glass shows the image in full size and brightness.

Information not listed on articles in the index, starting on page 12, frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge. A copy of this list may be obtained simply by sending a postcard to the Bureau of Information, Popular Mechanics Magazine, 20 East Ontario Street, Chicago 11, Ill.

"Third Hand" for Anglers Holds Fishing Rod

Fastened to the clothing, a new clamp holds a fishing rod securely, leaving both the angler's hands free for unhooking fish, changing flies or lighting a cigarette. Slots in the holder permit it to be fastened to the belt or suspender straps. The rod is slipped between two rubber balls which grasp it firmly. The balls are mounted off-center and can be adjusted to fit a rod of any size.



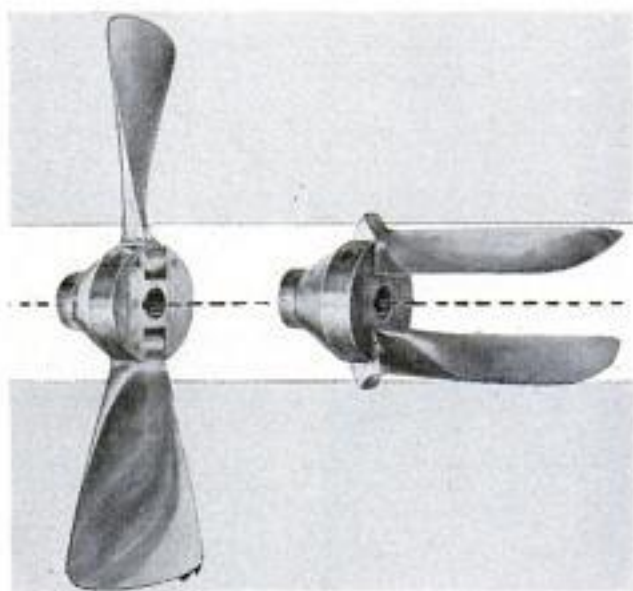
Bicycle Powers Gasoline Pump During Electricity Blackout



When a power failure at Sarnia, Ont., shut down his electrically driven pumps, gasoline dealer J. D. Murray didn't let it bother him. He mounted an old bicycle on the pump platform, removed the rear tire, and substituted a vee belt to drive the pump at the rate of $3\frac{1}{2}$ gallons a minute. During the 48-hour blackout Murray stayed open three hours later each day and pedal-pumped 1450 gallons of gasoline to help motorists who couldn't get fuel elsewhere.

Boat Propeller Folds Up When Not in Use

Designed for sailboats with auxiliary engines, a new propeller automatically folds up when not in use, reducing the drag. When the engine is started, the blades flip open to operating position. The secret is the extra thick tips on the blades. When the shaft is spinning, either in forward or reverse, centrifugal force opens the blades. Water resistance folds the blades again when the shaft stops spinning. In addition to reducing drag, the folded propeller is less likely to become fouled. Made of a special bronze alloy, the propeller requires no lubrication. It is available in the most popular sizes for sailing auxiliaries and in special sizes on order.



Nonrebounding Net Stops Golf Balls

Golfers can "warm up" on the course or practice in their back yards with a net that stops balls a few yards away from the tee. Heart of the net is a large foam-plastic pad that does not rebound the balls. Light in weight, the net is durable and weather-resistant.

☐ Vital business records will be stored in an atom-bombproof vault constructed in an abandoned railroad tunnel in the Santa Cruz Mountain range in California.



Superservice rolls into the field. With the equipment packed on truck, this combine can be serviced in 10 minutes

Service Stations on Wheels

SOME STRANGE, homemade vehicles are roaming the big farms of the West these days. They are mobile service stations which can cut the time required for servicing combines and other farm machines.

For an example of superservice on wheels, visit the 6000-acre farm at Grangeville, Idaho, operated by Roy Green and his two sons, Roy, Jr., and James. On a farm that large, machinery is always on the move to do spring plowing and planting, summer fallowing and weed spraying, harvesting and then fall plowing and seeding. Keeping the parade of machinery fueled and greased was quite a chore until the Greens ran an old truck into their shop and started rebuilding it. Out of the shop came a rolling service station that could cut the time required to service a combine from a half-hour to 10 minutes.

You'll find other mobile service stations all over the West, from trailers towed behind Jeeps to elaborately equipped trucks complete with small power plants and lights for night jobs. They all have the same job—to grease, oil and refuel machinery and get it rolling again in minutes.



Another farmer rigged up this trailer, complete with sunshade. Loaded on the trailer are modern facilities for fueling and greasing all farm machinery



Truck on Green farm had outlived its usefulness in hauling grain, so it was converted into service station

Jeep-drawn trailer doesn't carry as much equipment and fuel as a truck, but it can go just about anywhere





Exposed beams support the roof panels, which also serve as ceiling for the slab-door house

The House Made of Doors

By Thomas E. Stimson, Jr.

House built of slab-door panels is long, low and strictly modern in design. Garage is at right

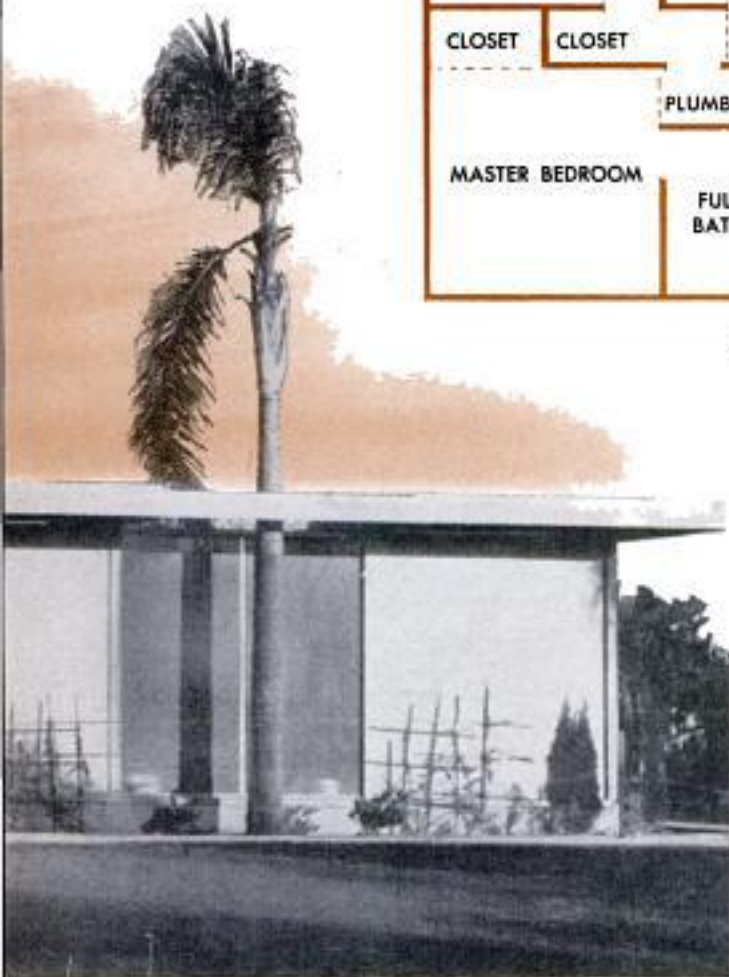
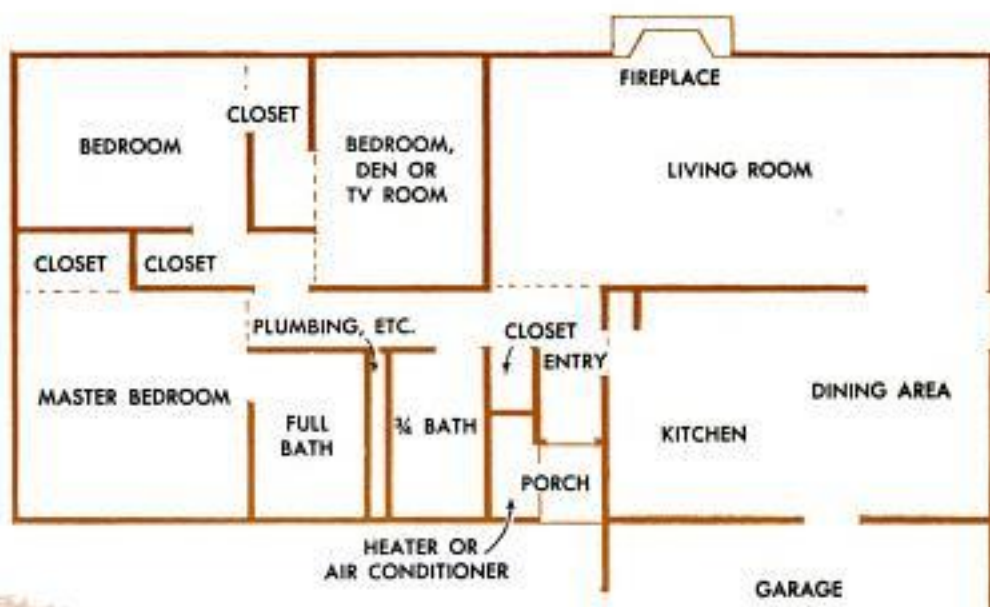




Cox displays a panel with the front face removed to expose its wooden spacing strips



Carpenters raise pair of exterior wall panels into place. Interior space saved by thin walls amounts to 150 square feet



SLAB-DOOR panels make up the walls and roof of an attractive California home that was built in two weeks for \$1000 less than it would cost to erect a comparable house of standard construction.

The panels are only 1 $\frac{3}{8}$ inch thick. But they provide four times the bracing obtained from ordinary stud walls and about 25 percent more insulation against heat, cold and noise.

One hundred and seventy three panels were used in the three-bedroom, two-bath test house. The 1270 square feet of living space is equal to 1420 square feet of ordinary construction because of the extra space the thin walls and partitions provide. A 20-by-20-foot garage is attached. The

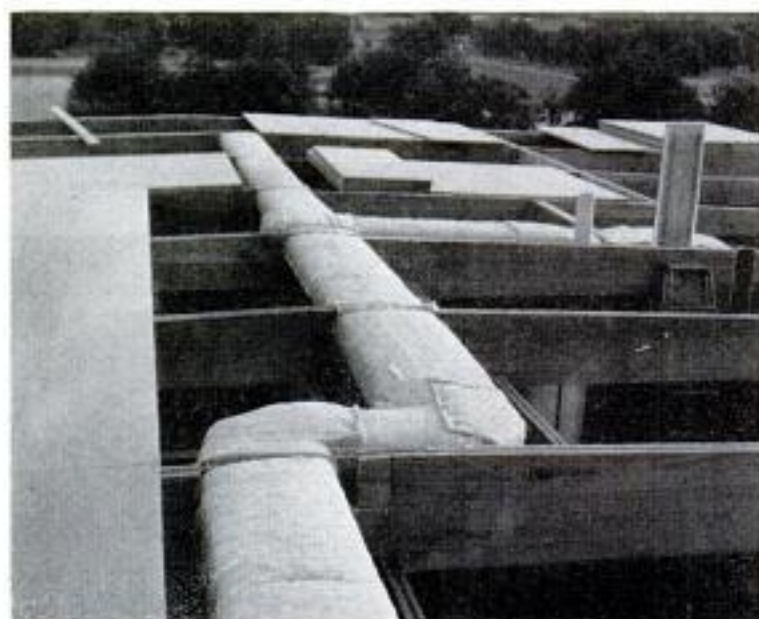


Roof panels in the slab-door house are topped by roofing paper, tar, insulating aluminum foil and final coat of crushed gravel



Cox operates a window opener that has been attached to panel in small unit built to serve as guest house or motel unit. Glass window panel at right is part of wall, does not open

Solid-core panels make up the roof deck. This construction view shows the insulated air-conditioning duct that extends along the center hall. Entire house was erected in two weeks



test house is completely air conditioned and has built-in kitchen appliances which include range, oven, dishwasher and garbage disposer. There is a big fireplace in the living room, considerable tile in the baths, lots of closet space and a copper plumbing system.

A two-bedroom house without the air conditioner, dishwasher and a few other items sells for about \$10,000.

The idea of using panels similar to slab doors originated when Henry C. Cox of Garden Grove near Santa Ana found by tests that ordinary hollow-core slab doors not only are sturdy construction units but have excellent insulating qualities as well.

Cox designed a panel something like a sandwich, faced on each side with a thin sheet of hardwood or other material and having a central core of wooden spacers and strips of insulating material.

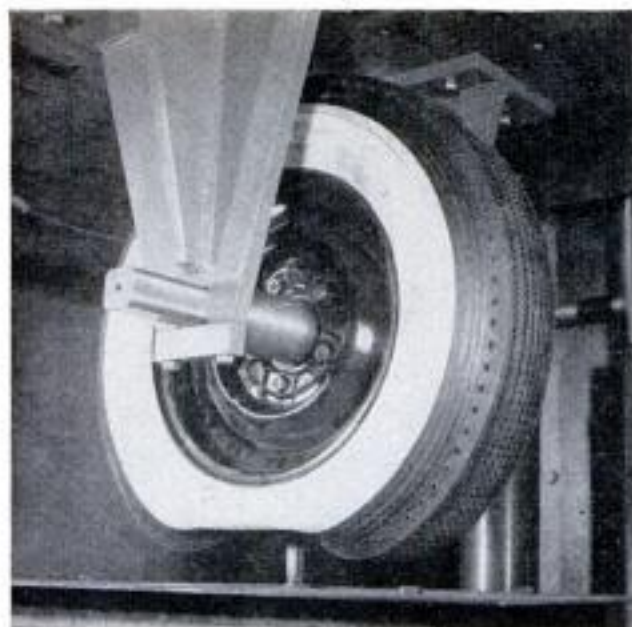
Panels used for the roof have solid cores and are nailed to tapered roof beams extending the width of the house. Roofing paper mopped on with hot tar goes on top of the roof panels, next a layer of insulating aluminum foil and finally a layer of crushed white gravel.

The foundation of the house is pier construction with 27 bearing posts and nine beams. Over the bearing piers are poured two layers of concrete slab.

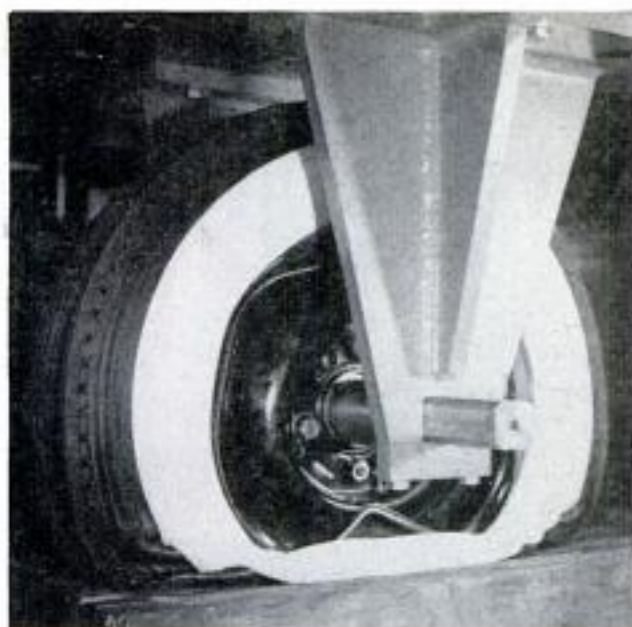
In addition to his test house, Cox erected a small guest house for possible use in mountain-cabin or motel construction. Cox is a subdivider specializing in the construction of low-cost homes. In the last 15 years his organization has averaged better than one house per working day. He expects his new slab-door construction to bring down building costs materially while retaining good design and quality construction.

The present slab-door house is engineered for moderate climates, but with only a few changes it would be comfortable all through the year in any part of the United States.

Components of the house, including panels and frame members, can be manufactured anywhere that a production line for making slab doors and milling the posts can be set up. ★ ★ ★



Stopped by a high-speed camera, the tire hits the railroad spike with a 1½-ton sock and is undamaged



Despite 11 impacts at forces up to 23,000 pounds, the tire lost no air although wheel rim was bent

11-Ton Pounding Bends Wheel But Fails to Damage Tire

On a giant drop press designed to test jet-plane landing gear, a new safety tire was spun at 125 miles per hour and smashed flat with 21,800 pounds of impact force, stopping it instantly—conditions that duplicate the landing impact of a jet fighter plane. Although smoke poured from the rubber and the steel wheel was bent back, the tire was undamaged. A third test in-

involved dropping the tire on the head of a six-inch railroad spike at impacts up to 3600 pounds and again the tire was undamaged. Photographs taken at $\frac{1}{15,000}$ second graphically show the abuse the tire underwent. Made with rayon-cord fabric, the Seiberling tire sells for 25 percent more than conventional tires. No puncture-sealing tubes were used during the tests.

Better "Atomic Calendar" Dates Objects From 44,000 Years Ago

Through a new system developed at the University of Chicago, scientists have a more accurate "atomic calendar" for dating objects back as far as 44,000 years. The present method of dating objects by the Carbon 14 they contain is reliable for a span of approximately 25,000 years. The

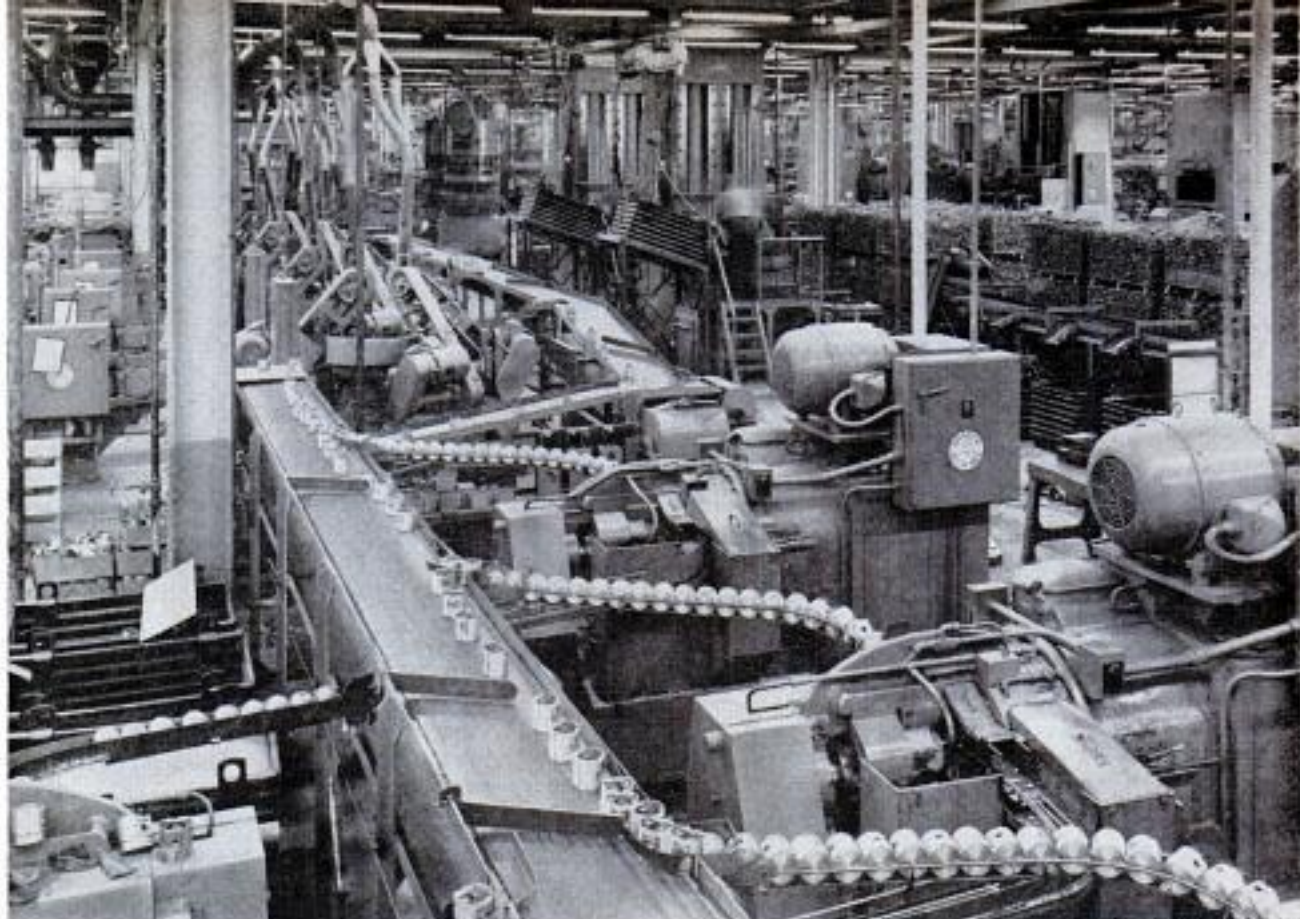
new system uses a scintillation counter housed in a freezing unit. The instrument detects radioactive Carbon 14 by the light its radiation produces in a fluorescent solution. The flickers of light are detected by phototubes so sensitive they would give off electrons at ordinary room temperatures.

Railroad Trainees Build Model Train and Miniature Right of Way



It's almost impossible to tell from a photograph that a scale-model locomotive and baggage car built at the Santa Fe yards in San Bernardino, Calif., aren't the real thing. Shop apprentices built the 1-to-10 scale-model train as part of their training program. Miniature scenery typical of the Santa Fe route lines the track. Next step is to apply power to the miniature General Motors diesel locomotive.

☐Uruguay may this year become the first nation with a completely dieselized railway system.



Ford Motor Co. photos

Pistons march down an automated line and find their way to machines which automatically grind and bore them

Is the Automatic Factory Here?

"Electric brain" of an engine-block line receives information, makes basic decisions, issues orders

By Clifford B. Hicks

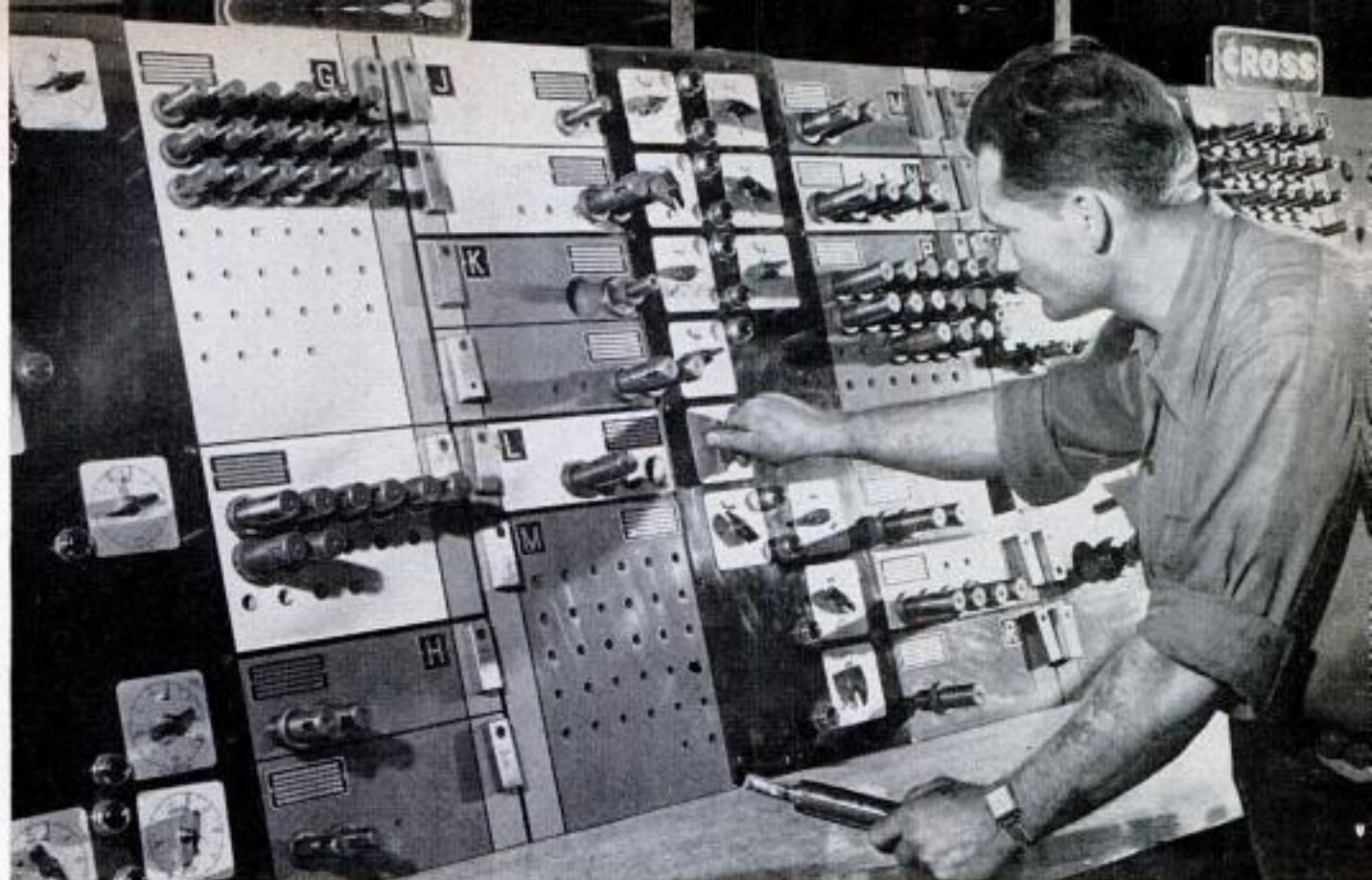


FINAL INSPECTOR'S steel arm pushed the faulty home appliance onto the "reject" belt and his electronic brain sent a protest about poor insulation to Production Manager.

In the front office, Production Manager clicked half a dozen relays to reprimand Insulation Superintendent. Immediately Insulation Superintendent demanded reports from his subordinates. Dip Bath checked in satisfactorily. So did Dip Machine. Ah, Drier was at fault. Some of Drier's heat lamps had burned out. Immediately Insulation Superintendent turned on his red alarm light to signal a human for help.

Science fiction? Well, the incident above never has occurred, but a good many of these robot workers, inspectors and production managers are plugging away at their work right now. Consider the following examples:

- A "brain" with a built-in tape recorder, developed by General Electric, directs every intricate movement of a milling ma-



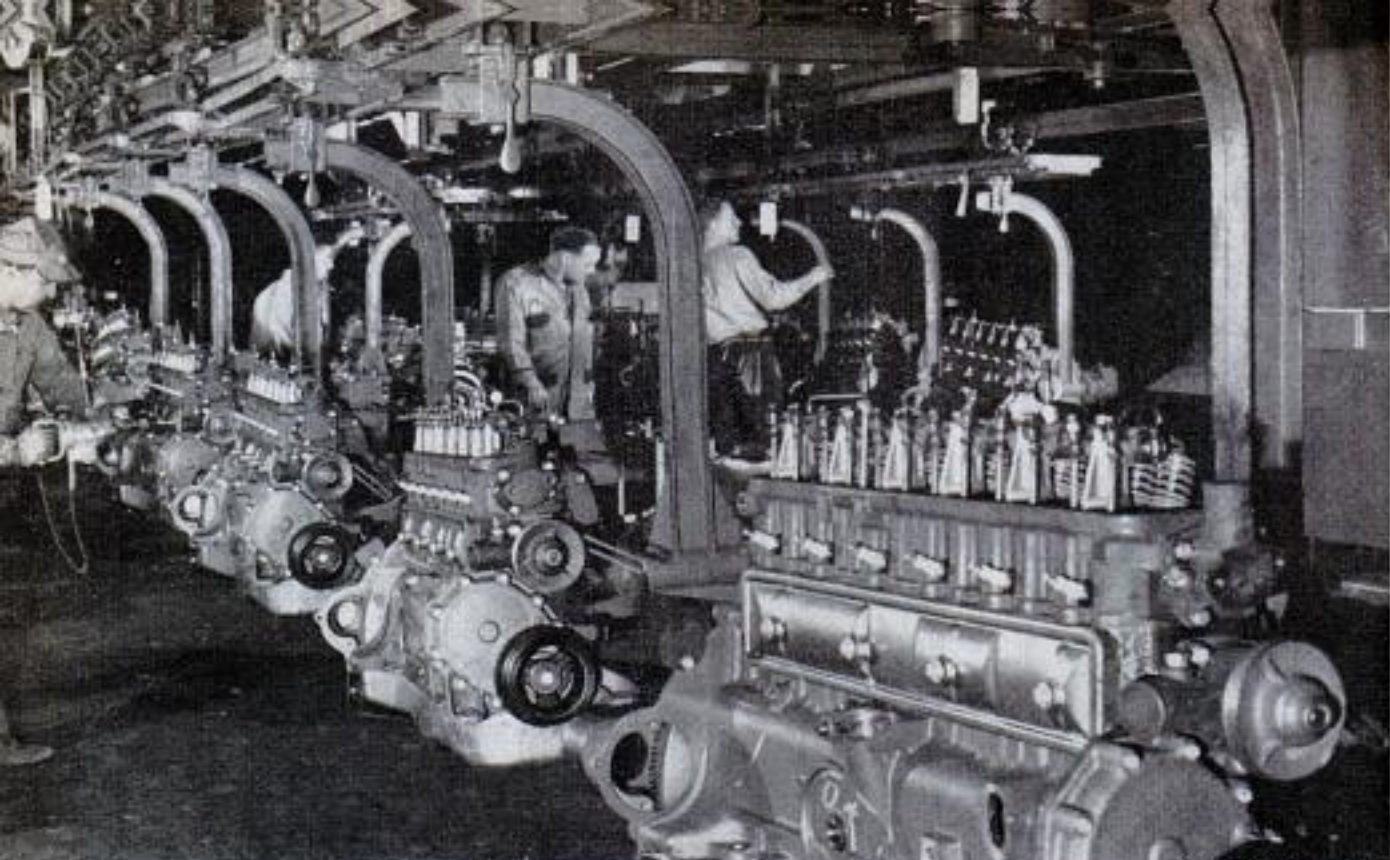
Machines inspect themselves. Control panel has preset dials which turn off machine when a tool is worn out

chine. To prepare the brain for its job, a human guides the milling machine as it cuts a particular part. Meanwhile the intricate movements are recorded on tape. Then, whenever the tape is played back the machine duplicates its original motions and turns out another part, like an old-time roller piano hammering out a tune. Unlike the human operator, the "brain" needs no food, sleep or companionship.

One man literally has finger-tip control over a new chemical plant at Marcus Hook, Pa. Thousands of meters, gauges, relays and controls work like humans—and even make spur-of-the-moment decisions—to convert ordinary gasoline into other chemicals. The operator, seated at a control board, dials station after station on the chemical production line. Meter readings flash across the glass panel in front of him

Automation aids car-body workers by holding and moving the steel panels and moving the tools into position





Ford Motor Co., photos

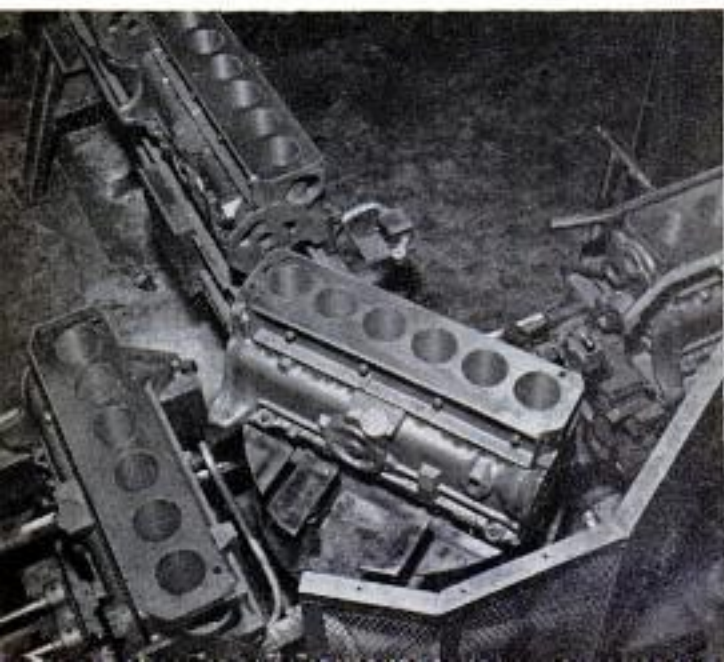
By pushing buttons the worker can direct arms of steel to pivot or tilt the heavy engines into any position

as the robot men and their superintendents report from remote stations.

At a new Westinghouse plant in Columbus, Ohio, the parts for refrigerators and home freezers march along 27 miles of automatic conveyors. Many parts are installed by the automatic assembling machines. The finished appliances are enameled automatically, then whisked through a crating machine that slaps and nails boards around them.

Automatic brains and tools are even marching out of the shops and into the offices. A new electronic system for a Chicago mail-order firm gulps down catalogue orders as fast as 10 operators can press keys. In much less than a second, an operator can find out the total number of orders on file for a particular item. The

Engine blocks in two lines march into unattended "turntable station" which rotates them 90 degrees



machine does the work of 39,000 adding machines and much of the brain work of the 40-odd girls who formerly classified and recorded the orders.

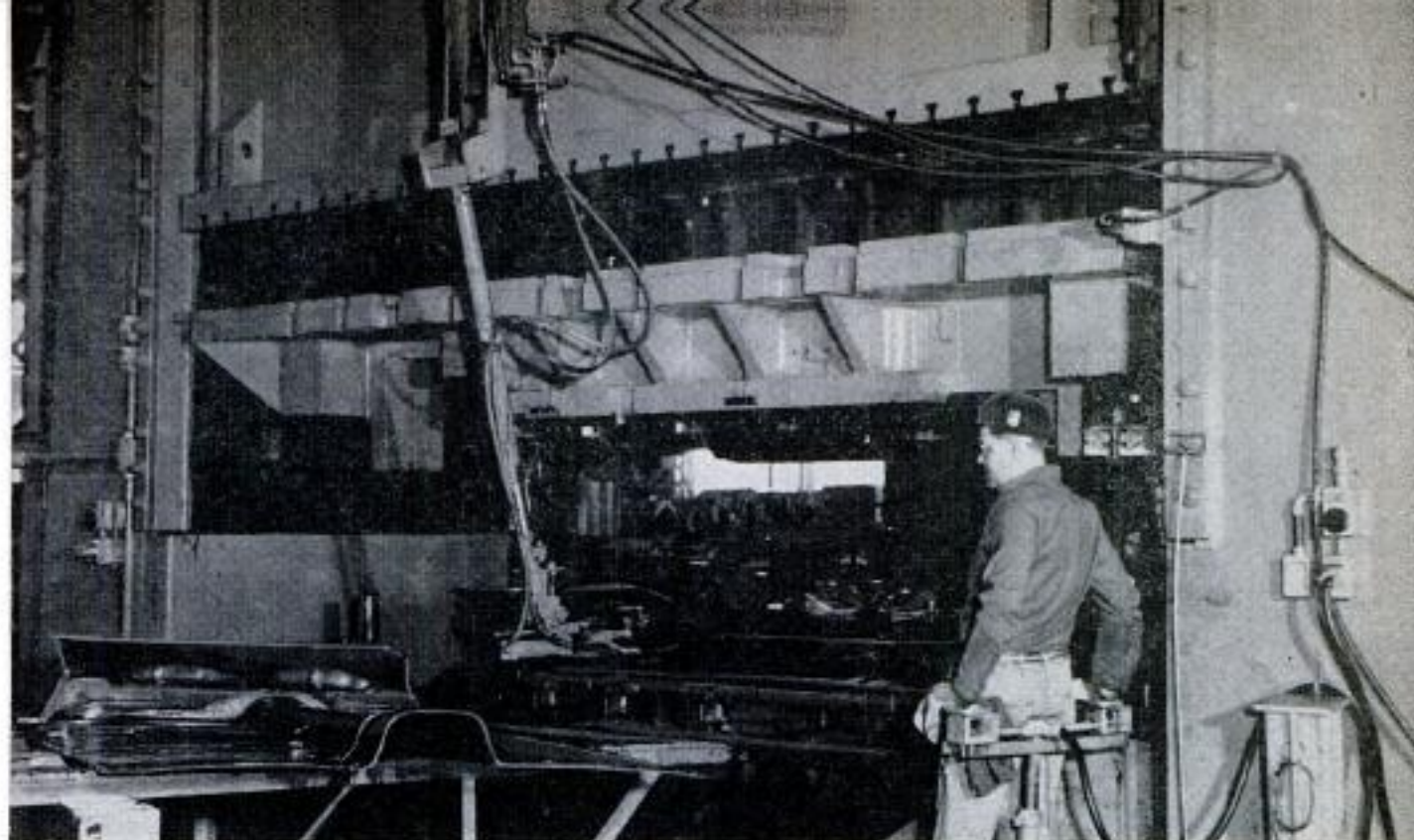
Dr. Simon Ramo, head of the Ramo-Woolridge Corporation and one of the nation's leading authorities on "synthetic intelligence" declares flatly: "It is possible for engineers today, on the basis of known science, to produce devices which could displace a very large fraction of the white-collar workers who are doing routine paperwork which can be reduced to simple thought processes."

Today's automatic machines with their electronic brains are the advance guard of a new army of workers. An appropriate word has popped into the language to describe these "synthetic" workers and thinkers, a word that likely will be as commonplace as the word electronics within five years. That word is automation.

Down-to-earth engineers, supervisors and even businessmen are becoming experts on automation. This is not a Rube Goldberg dream nor the zany "Technocracy" of the early '30s, but a new Industrial Revolution, a revolution that is coming slowly but inevitably.

The first Industrial Revolution replaced man's muscles with machinery. The new revolution, most automation experts firmly believe, will replace man's routine brainwork with machines. Dr. Ramo says:

"Surely no one can deny that the replacing of man's brains will effect some sort of revolution. The biggest factor in changing



Pneumatic "iron hand" reaches into a big press, snatches a sheet of steel and deposits it on a conveyor

all business and industry must be the coming of the age of synthetic electronic intelligence. He who would dare to stand up and contest such a statement runs the risk of having his brains among the first to be replaced!"

To see how synthetic brains can be built into entire assembly lines, take a look at two types of plants which are as highly automated as any in existence today. One turns out a product that weighs hundreds of pounds, the other a product that weighs only a couple of ounces.

When Henry Ford first started pulling the chassis of a car along an assembly line with a rope, he started pulling the company into automation. Today the recognized giant in the field of automation is the Ford Motor Company. Ford engineers drum out impressive statistics and crackle with enthusiasm whenever the word automation is mentioned. In 1947 an entirely new—and big—automation department was set up within the organization. Today no industrial plant of the Ford Company is ever planned, built or remodeled without major emphasis on automation.

Many of the other auto manufacturers are introducing automation at spots throughout their plants, but Ford is promoting the new technique on what it calls a "cornfield" basis; automation engineers are called in before the site is even cleared and pitched the problem of designing the automated production line. This in turn determines the design of the entire plant.

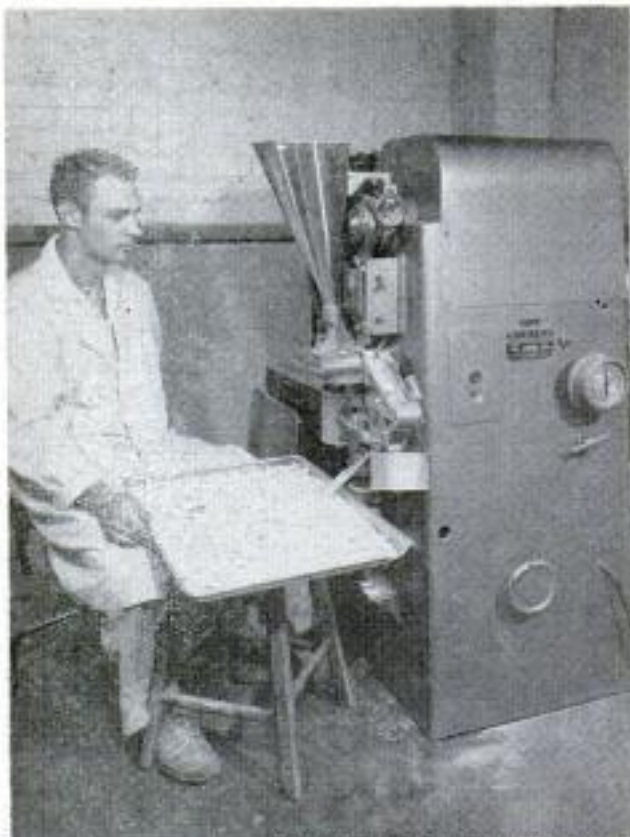
Ford has recently built several plants that are as automated as it is economically possible to build. The two top examples



Scales at right weigh connecting rods and set cutters on machine to trim away precise amount of metal

Operator watches lights flash on control board which shows movement of castings through drilling machine





National Bureau of Standards photos

Press stamps out ceramic wafers by the thousands, checks them for accuracy, rejects all faulty ones

are the engine plants at Cleveland and Dearborn, Mich.

The monster robot-with-a-brain in these plants is the transfer machine—a huge unit which combines many different machines. Transfer machines are built to perform various jobs. One of them, for example, gobbles up the rough casting of a crankshaft and pushes, pivots and positions it through an intricate pattern. Cutting tools drop down at the proper moment to drill six oil holes, six metering holes and six balancing holes at precise spots. Eventually the crankshaft moves to an electronic inspector which spins it to see if it is in balance. If it's not perfect, the miniature brain tells the machine the precise spot where metal must be removed. Some day, say the automation engineers, it's quite possible that the casting will start out at the beginning of the line and end up in a completed car a mile away.

The engine-block line at the Cleveland plant can produce 4600 brand-new six-cylinder engine blocks each day. It's actually a single serpentine tool 1545 feet long. Built into this unbelievably complex tool are 42 automatic machines, linked together with the most modern of automatic conveyors. Rough castings stalk rhythmically through the tool, which pushes, pulls and turns them end over end. The castings pass through 42 automatic machines which perform 530 precise cutting and drilling operations. If anything goes wrong in any of the

operations, that block is easily detected and corrections made.

Not only does the automatic line perform this work and check its accuracy, but it also inspects itself. Beside each of the big transfer machines is an "automatic tool-control board." Each cutting tool in the machine is represented on the board by a dial, preset at a particular number of cuts corresponding to the known life of the tool. When the tool has performed its life's work, the big transfer machine shuts itself off and the operators check the dials and insert a new cutting tool at the proper place.

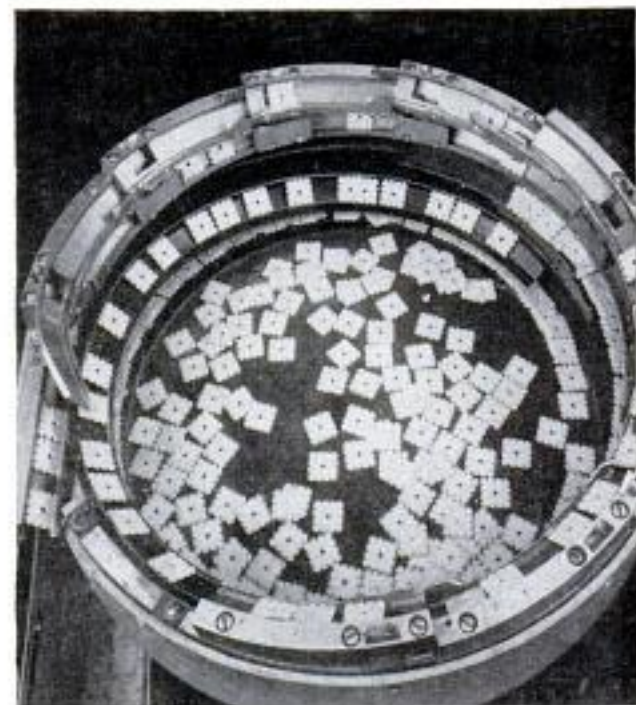
You'll find the second top example of automation in a miniature manufacturing plant tucked away behind larger buildings at Arlington, Va. Here, virtually without the aid of human beings, automatic machines are turning out radar components and other electronic units.

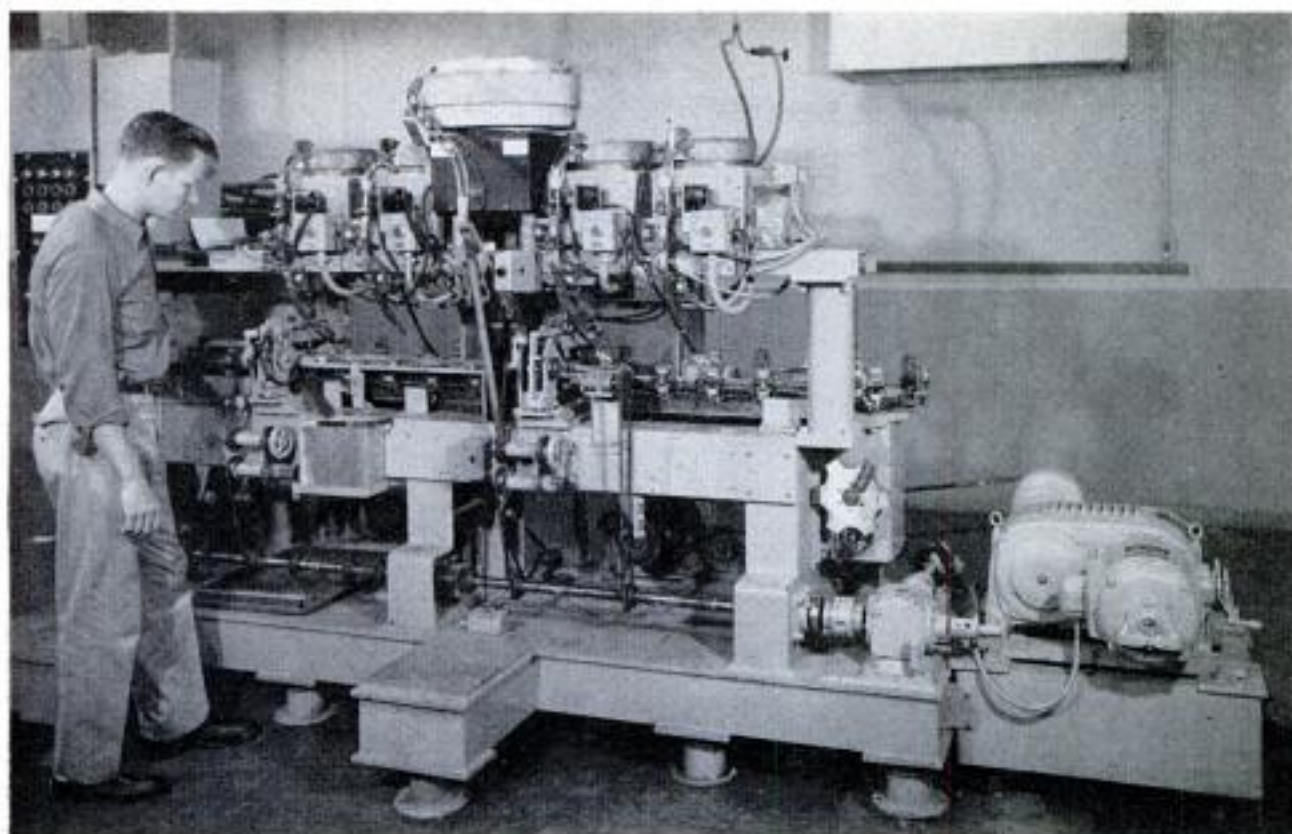
Slip back, for a moment, to 1950, when brand-new Navy fighter planes, desperately needed in Korea, were lined up on runways in this country. The planes were rolling out much faster than the radio and radar components that went into them.

The Navy Bureau of Aeronautics knew it was too late to do anything about the existing electronics jam, but it asked the National Bureau of Standards for help in solving the problem for future emergencies. The Bureau assigned Robert L. Henry, one of its top young electronics scientists, to the job. The project was given the code name "Tinkertoy." Today that word brings excited comments from almost any radio manufacturer.

NBS knew that an entirely new concept

Wafers in bottom gradually climb ramps of vibratory feeder, which orients them properly for next machine





Worker simply watches while this intricate machine positions tiny capacitors and bonds them to the wafers

of production was required if laborious handwork were to be eliminated. Take a look at the bottom of a conventional TV chassis or radar panel and you'll see a jungle of wires, capacitors and resistors. It seems impossible that these units could ever be made by automatic machines. There has always been a surprising amount of handwork involved in building even a table-model radio. Each separate resistor

or capacitor has to be installed by hand, each separate wire soldered to its terminal by a hand-held iron.

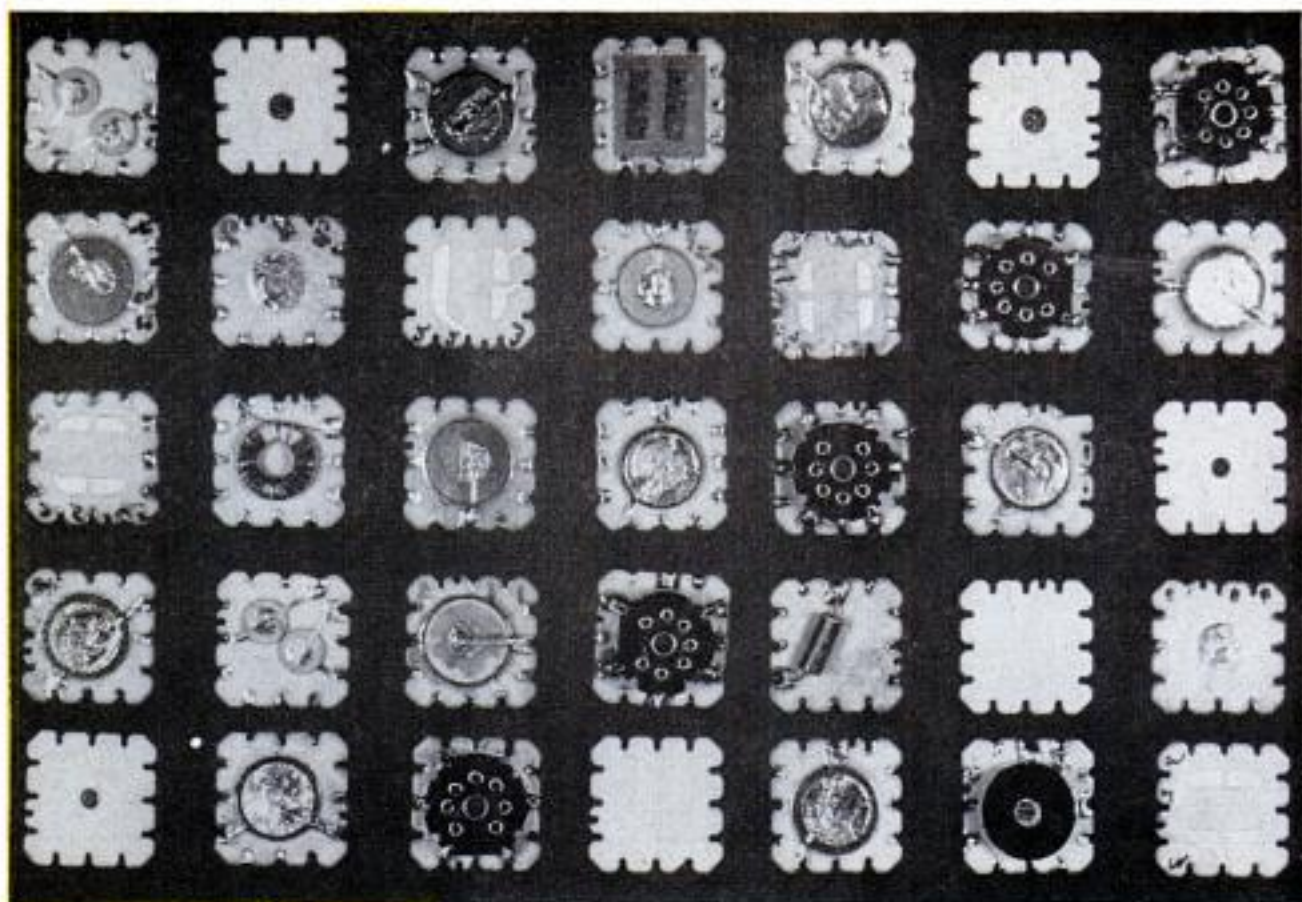
The only thing to do, Henry and his co-workers decided, was to alter the basic design of electronics gear. Their answer, many months later, was a new "three dimensional" system.

The engineers began by stacking the elements—circuits, resistors and capacitors—

Wafers slide down chutes into a stacking jig. Wires rise automatically and are soldered into the notches

Henry, in charge of developing the system, holds module completely made and inspected by machinery



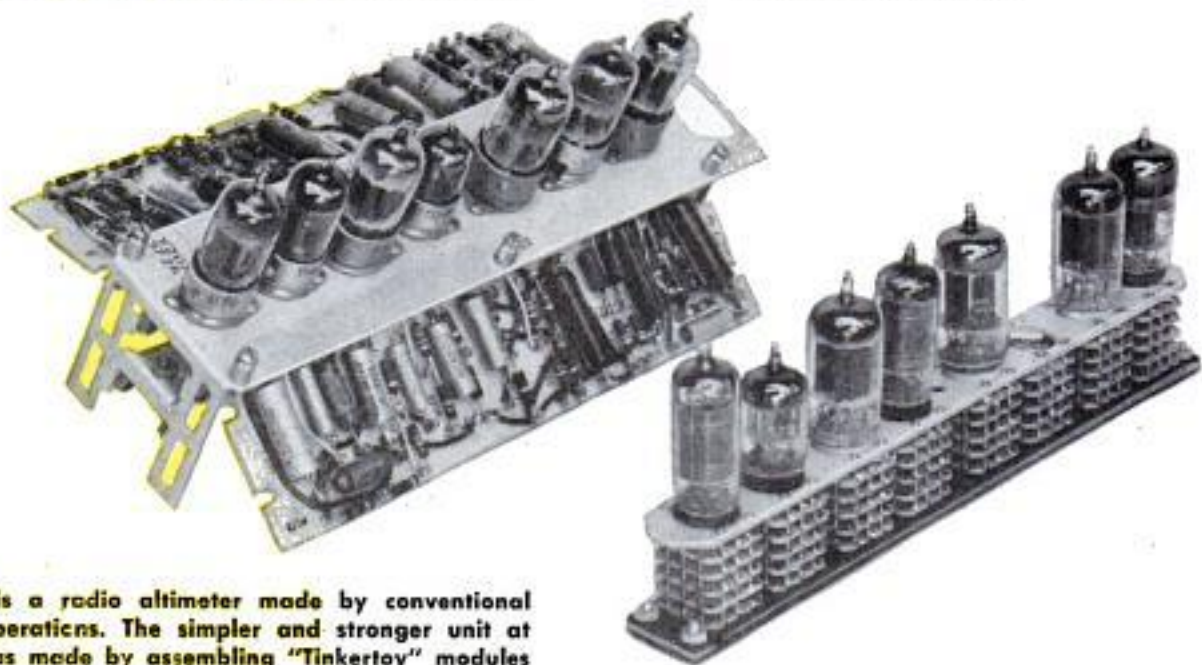


Wafers with printed circuits are stacked to make a module. Here are a few of the infinite possible combinations

on top of each other and then surmounting the whole unit with a tube. The tubes, they figured, could be cross-connected to build up almost any kind of electronic unit from a two-tube radio to a complex radar installation. In order to stack the elements, they developed tiny ceramic wafers $\frac{7}{8}$ inch square and $\frac{1}{16}$ inch thick. Each wafer has 13 notches around its edges—three on each edge and one to serve as a key in guiding the wafer through the machinery. A tiny circuit is printed in silver on each wafer.

On the wafers are mounted adhesive-tape resistors, titanate capacitors, tube sockets and other electronic components. The wafers then are stacked about $\frac{1}{8}$ inch apart and wires soldered into the notches. The wires not only give the unit its strength but carry the circuit, which passes through the printed pattern out to a notch and up the wire to the next wafer or any other wafer in the stack. The result is a small sturdy unit which is stronger and far easier

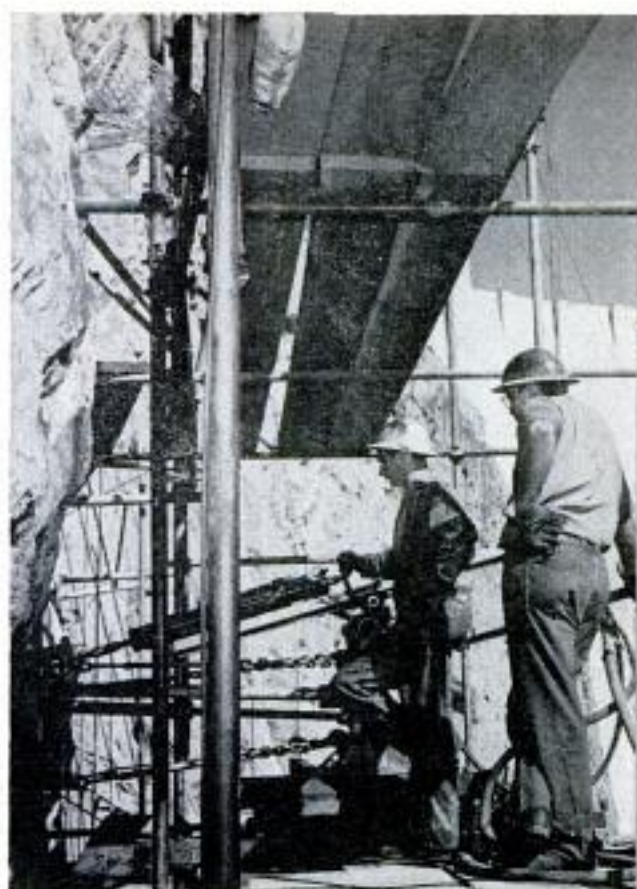
(Continued to page 240)



Above is a radio altimeter made by conventional hand operations. The simpler and stronger unit at right was made by assembling "Tinkertoy" modules



Huge rock slab hangs just above the valve house. Scaffold for the workmen was built around the slab



Drill grinds away to cut a hole in the slab. Holes were drilled 13 feet into solid abutment behind slab

Rock Anchor

ENGINEERS at Boulder Dam have just completed a unique and difficult job—anchoring a gigantic slab of rock to the canyon wall. The big slab of rock juts out above the valve house of the dam. In the 17 years since the dam was completed no movement of the slab has been noticed, but Bureau of Reclamation officials want to make certain that it never “falls off” the canyon wall in an avalanche of destruction. The enormous slab is about 180 feet long, 120 feet high and 19 feet thick. To anchor it, 349 holes were drilled through the slab and into the rock abutment. Grout then was forced into each hole and a huge anchor bar driven into the grout. When the grout was dry a nut on the threaded end of each bar was tightened against a bearing plate. The contractor also is filling the seam between the rock slab and the abutment with grout. When completed, the slab will be as permanent as the dam itself.

Grout is forced into the holes and then anchor bolts driven into the grout. Strain gauge tells the tension as the nut is tightened

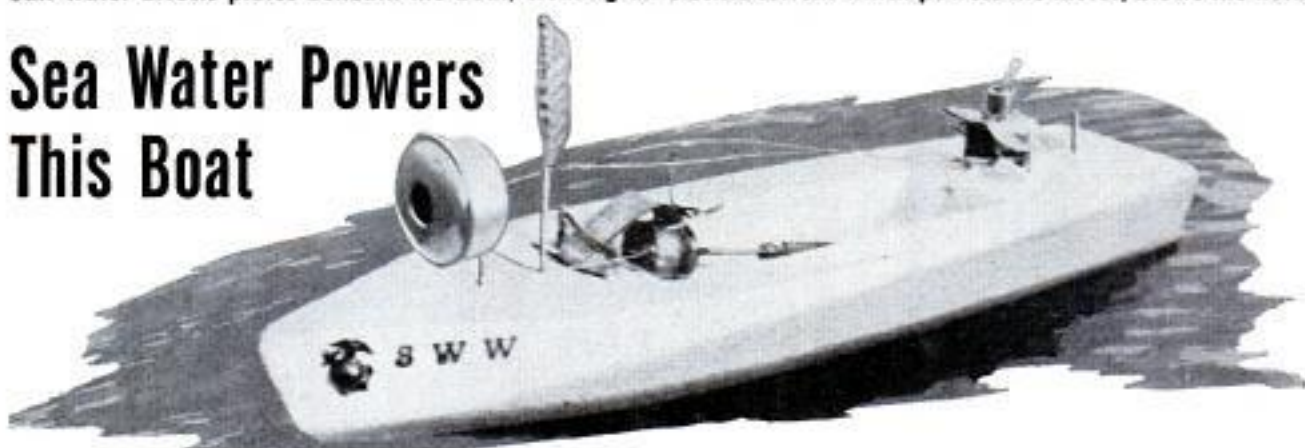


JUNE 1954



Salt water affects plates beneath the boat, creating an electric current which powers the motor, blows the horn

Sea Water Powers This Boat



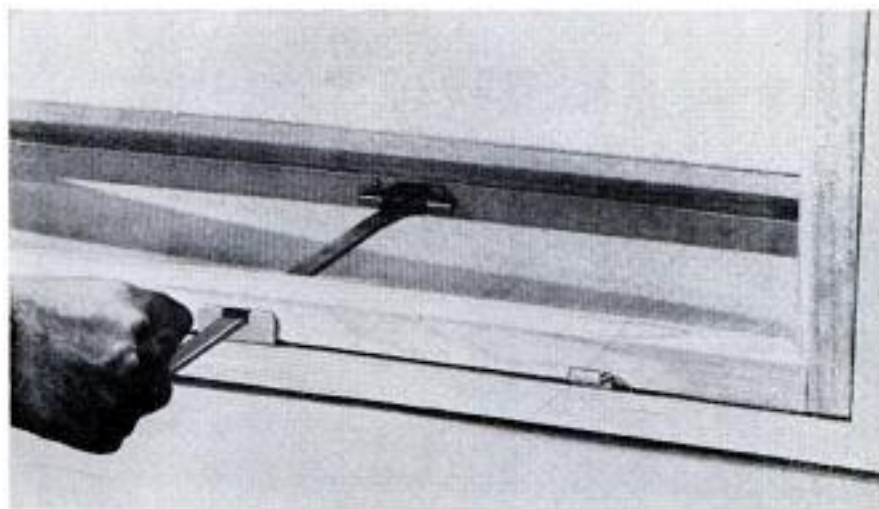
Propeller starts spinning furiously as soon as the craft's keel plates are lowered into the sea water



WHENEVER Ralph McCabe, 52-year-old inventor of Forks of Salmon, Calif., lowers his model boat into the sea, its propeller starts spinning furiously and the boat scoots off across the surface. The craft is carved of foam plastic and is powered by a $\frac{1}{2000}$ -horsepower electric motor. What provides the electricity? McCabe has developed a system of using the sea water as an electrolytic fluid. Beneath the boat are three deep keels that resemble the plates of a storage battery. The two outer plates are made of zinc with the outsides nickel plated. The center plate is made of a carbon-and-graphite composition and has tiny corrugations to give it an outside area greater than the zinc plates. The salt water sets up an electrolytic action to produce a current which powers the motor. The power generated is rated at 3000 milliamps and 1250 millivolts, which spins the propeller 2650 revolutions per minute running free or 750 revolutions per minute submerged.

Three Jeeps Ride in Marine Corps' Biggest Helicopter

Either 26 fully armed troops or three Jeeps can fly in the Marine Corps' new XHR2S helicopter. It has a retractable landing gear that gives it a more streamlined appearance and allows it to travel more than 150 miles per hour. To make it more compact for ground transportation or storage, the main rotor blades of the Sikorsky-built "whirlybird" can be folded back along the top of the fuselage and the rear rotor arm, hinged to the fuselage, can be tilted forward in an arc so that it lies atop the rear fuselage.



Window Opener Fits Under Screen

Windows with interior screens are opened and closed by a metal bar that slides through a hole in the window-screen frame. After the window is pulled shut the bar folds flat against the frame. A catch holds the bar, locking the window. The closing device is an optional feature on one company's line of standard units.

Metal Stepladder Folds Compactly

Painting, paperhanging and other jobs around the home are simplified with a lightweight metal stepladder that has two roomy steps and a large working platform. A detachable standard on top holds containers or tools at various heights. The collapsible aluminum-magnesium ladder weighs only 67/8 pounds.

☐ First movie ever copyrighted in the United States was *Fred Ott's Sneeze*, in 1894; running time: two seconds.



ONE-PIECE GYM

CHANGING A FEW attachments makes it possible to use a new one-piece gymnasium to exercise every muscle in the body. Strong and weak alike can use the apparatus effectively, since it adjusts to the individual's strength and height. It operates on the principle of putting gravitational pull to work at many different angles. The machine consists of a ladder which fastens to a wall, a track which hooks to any one of the ladder's rungs and a cart, mounted on eight casters, which rides up and down the track. Body weight supplies the necessary resistance, but weight may be added as desired. It is made almost entirely of oak.

1. In dead lifting the machine keeps the weight well away from the body

2. Parallel bars are formed by using upright cart to support the track

3. Adding heavy bar bells makes the rowing exercise even more strenuous

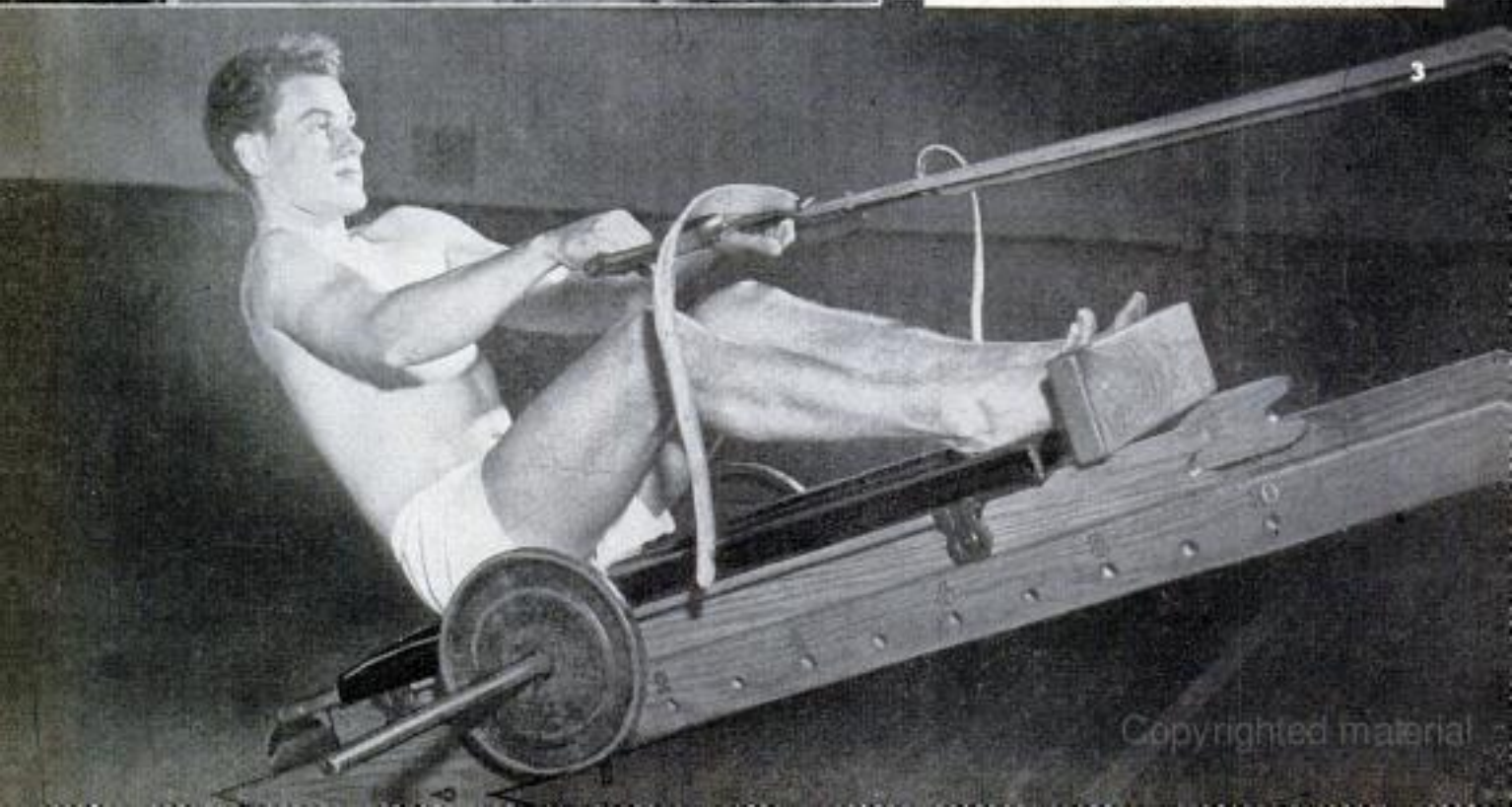
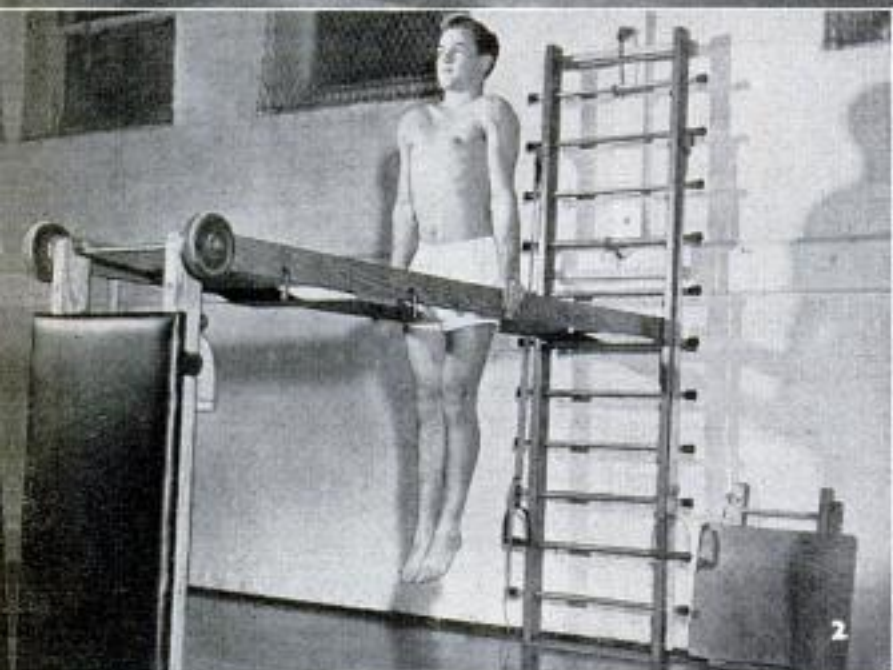
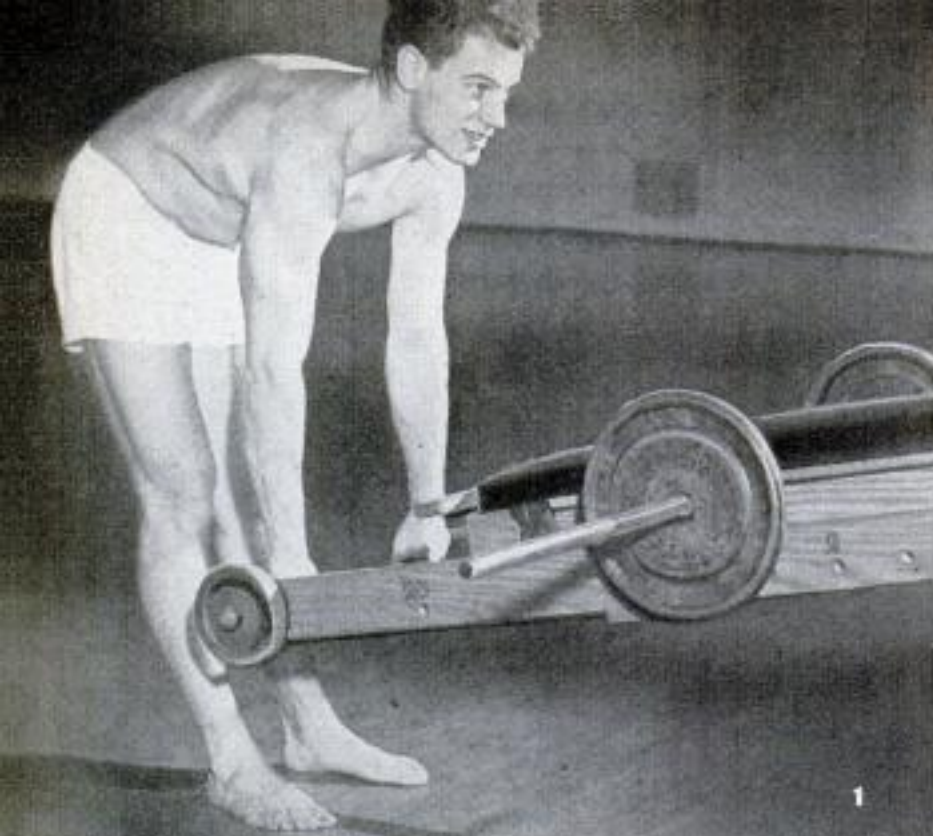
4. Nine feet high, the versatile gym can be folded compactly against wall

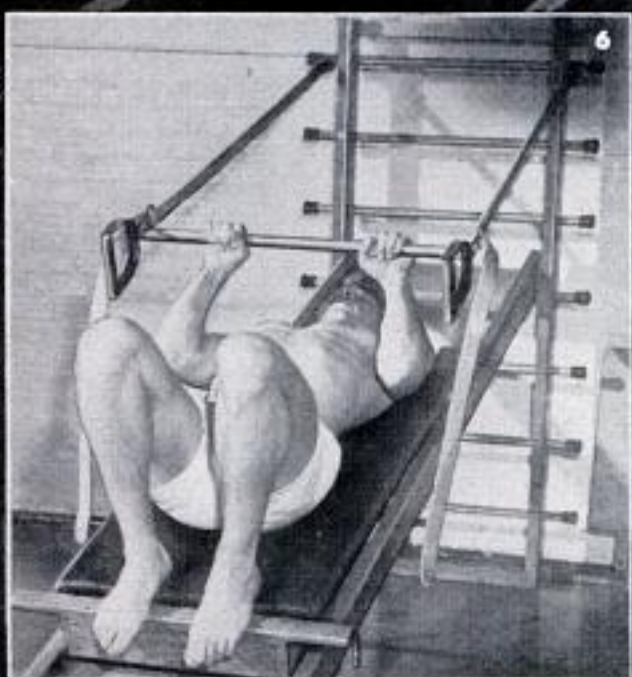
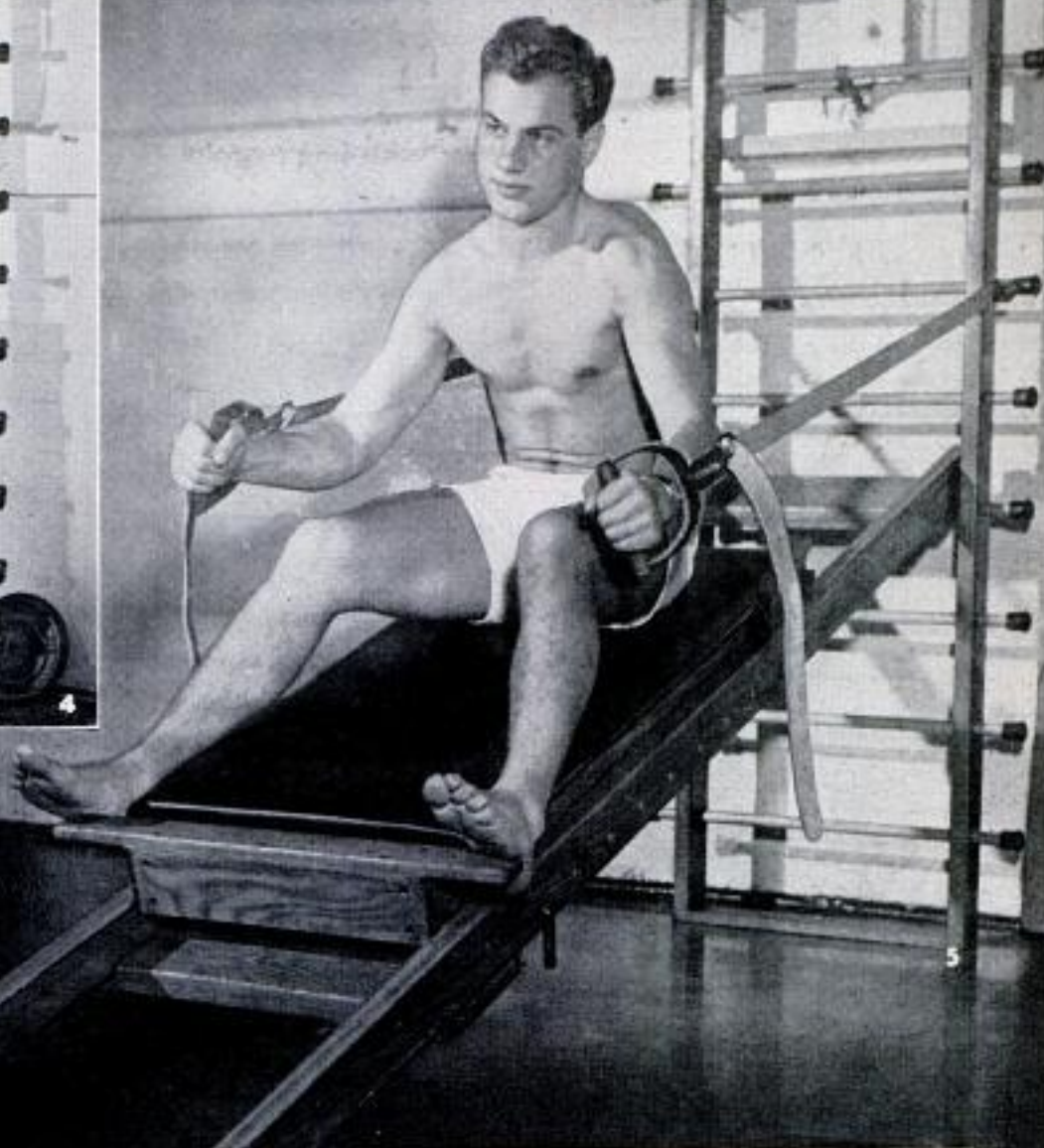
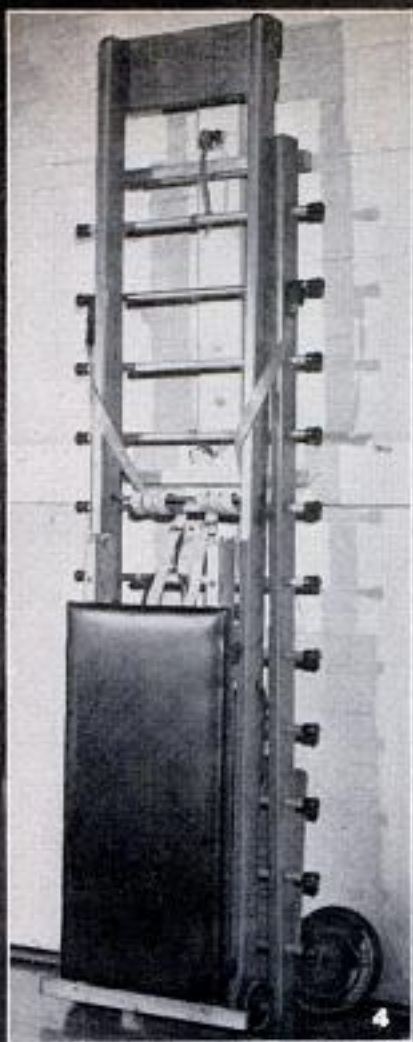
5. For push-outs the apparatus offers more resistance than wall pulleys do

6. Chinning exercise can be made more difficult by increasing the angle

7. To do deep knee bends the subject glides up and down on castered cart

Photos by Erling D. Davidson





Three-Wheel Tractor With Implements Handles Small-Farm Work

Most of the work of a big tractor is performed by a small one designed for full or part-time farmers living on plots ranging from 3 to 30 acres. The little three-wheel tractor, offered by Sears, Roebuck and Company, costs \$598 by mail order. Also available are 12 implements which make the tractor suitable for all kinds of crop work as well as lawn mowing and snow removal. The single rear wheel is the power wheel, driven by a 6.2-horsepower air-cooled engine. A unique variable-speed system permits the farmer to change speeds from $2\frac{1}{4}$ to $4\frac{1}{2}$ miles per hour without using the clutch. The front axle is adjustable from 48 to 72 inches, so the tractor can be used to cultivate two rows up to 36 inches apart. A swivel between the front and rear sections is operated by the steering wheel, allowing an eight-foot turning radius. The attachments include a moldboard plow, spike-tooth harrow, two-row planter, disk harrow, spring-tooth harrow, two-row cultivator, middle buster, bulldozer, seven-foot dump rake, lawn mower and a snow plow.



High-Velocity Rockets Test Supersonic Wing Shapes of Future



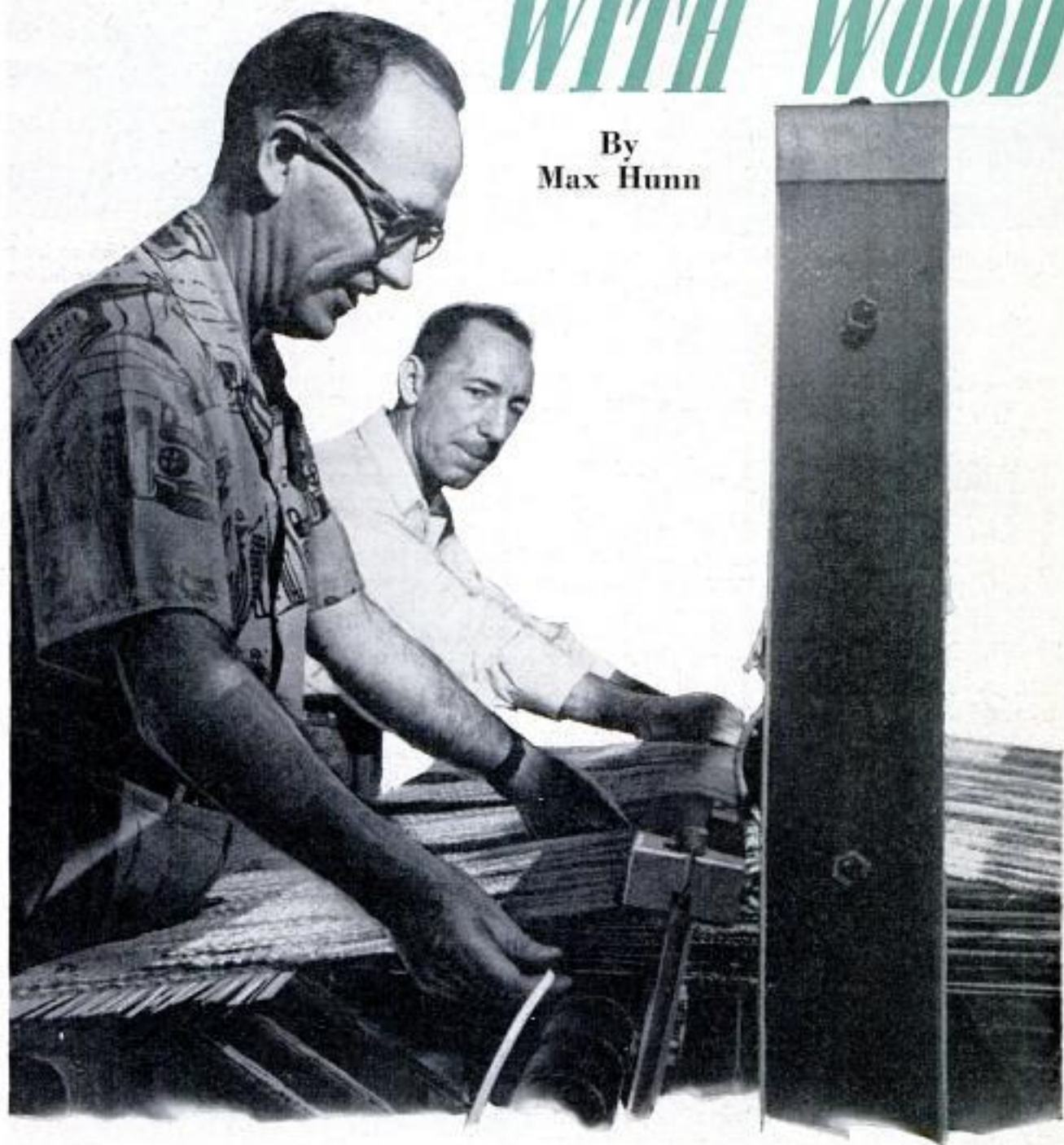
Scale-model airplane wings are being test flown on high-velocity rockets at Lockheed Aircraft to determine their capabilities at supersonic speeds. Instead of warheads the five-inch rockets carry cameras and electronic apparatus. Cameras packed in the nose take movies of the wing's behavior and the electronic equipment collects and radios test data to recording devices on the ground. Parachutes automatically lower the rockets and their instruments, which sometimes travel at speeds as high as 1500 miles per hour.

Lockheed Aircraft Corp. photo

Two men looking for a climate found themselves
in business with a tiny loom. Now they're

WEAVING A CAREER WITH WOOD

By
Max Hunn

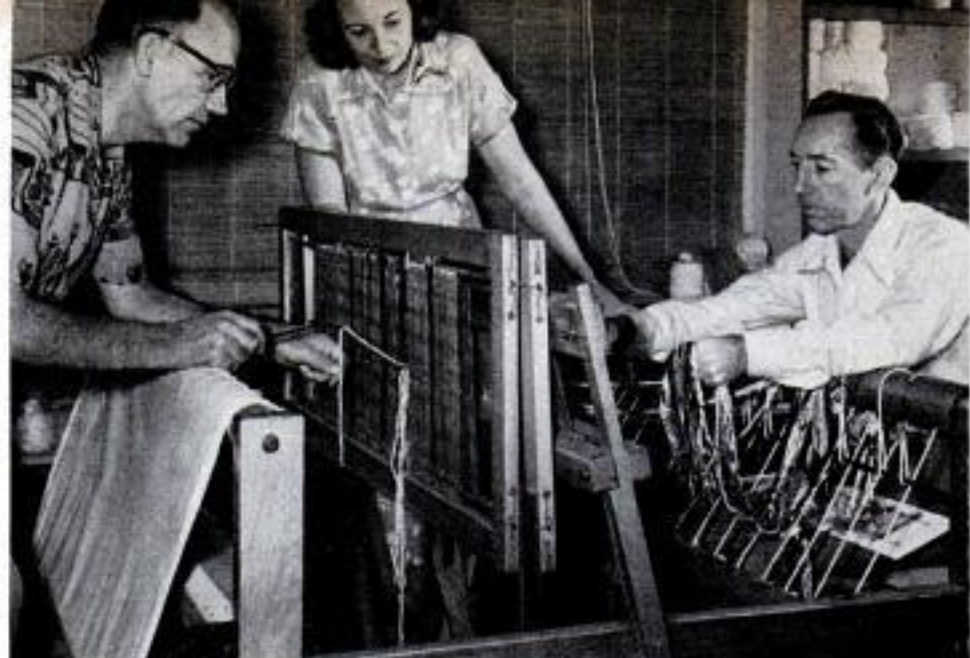


Wisroth inserts wooden strip in 120-inch loom as Felver stands by. Yarn and wood are combined in the loom

FLORIDA SAND in your shoes, a fast-talking real-estate agent, virtual bankrupt and a small, hobby-type hand loom hardly sound like the ingredients of a success story. Yet they led to the establishment of one of Florida's most unusual businesses—wood weaving.

The weavers are Victor Felver and

Charles Wisroth, who today operate a thriving concern known as Vik-Roth Weavers, in Miami, Fla. They're busy turning common and rare woods into colorful draperies, lamp shades, fire screens, room dividers, serpentine screens, wall coverings and panel inserts for tables. Interior decorators snap up the output.



Experimenting with yarns and woods, the two men develop an original pattern which is then set up on loom. Felver uses design card as he selects each strand, which is drawn through loom by Wisroth using a special tool

But the story of how the little business started is as interesting as the business itself. Felver and Wisroth were old friends. Felver, of Newark, N. J., an engraver with textile firms, made the final plates from designs worked out by artists. Wisroth, originally an interior decorator, operated a gift shop in New York.

Both had visited Florida, succumbed to the common malady known as "sand in the shoes," and resolved to return. In 1951, they abandoned their former vocations and headed for Miami.

In the Magic City they ran afoul of a fast-talking real-estate agent who persuaded them to take a three-year lease on a location for a swank gift shop. Stocking the shop with unusual and costly items, they set up a business and waited for the customers to batter down their doors.

They had made only one mistake. The agent said there was plenty of traffic. There was, but it kept moving right past their door.

Bankruptcy loomed. They sold most of their expensive items wholesale to other gift shops and began to search for a new means of making a living.

During their shopping they had picked up a small, hobby-type table loom, more of a toy than anything else. This, although they didn't realize it at the time, was the key to their future success. While waiting for the customers who never came, they taught themselves to operate it.

Wisroth, the interior decorator, had once made lamp shades of unique design and sold them in his New York gift shop. Now he suggested to Felver that they try their hand at wooden shades for driftwood lamps.

Experimenting on the tiny loom, they combined palm fronds with colorful yarns in intricate patterns. The resulting woven

wood was made into lamp shades which began to sell.

Soon they worked out an arrangement with a distributor and concentrated upon producing the shades.

Interior decorators became interested, and soon the weavers were asked to make not only original lamp shades, but to produce lengths of woven wood suitable for unusual draperies, screens and other decorating features.

The table loom was no longer adequate, and a search began for more and better equipment. They finally found an old 44-inch loom in a Miami attic and purchased

When special colors are desired, Wisroth dyes yarns in a small kitchen that adjoins the weavers' shop





After yarn pattern is set up on loom, each piece of wood is inserted individually and shuttle operated by hand

it for \$100. They added a second 44-inch model later.

But the new loom sufficed only for a short time. Interior decorators wanted larger and larger widths, and the two men once more started a hunt for new equipment. They needed a 10-foot loom—120 inches—but finally were forced to remodel an old loom in order to get the necessary width. Today, the 120-inch loom is the largest of its type in the country, they believe, and is extremely useful. Later they bought a new 90-inch loom in Canada, and this became their fifth loom, which completes their equipment.

Wood weaving is a slow task, and is strictly hand labor, for the looms are not power-driven, and can not be mechanized since the intricate work requires individual attention.

In weaving, the yarns, which provide one part of the color scheme, run vertically, and the wood strips run horizontally. Each piece of wood is inserted individually, and the pattern is created by the spacing of the wood plus the arrangement of the yarn. The best one man can do on a loom, after it is set up (no small task in itself), is weave about 35 lineal feet in an eight-hour day. Both men do the weaving, and on the

Lamp shades of woven wood are made to order. Wall panels and sectional screen are made from same product



large 120-inch loom must work together. Two pairs of hands are needed to insert the wood and weave the yarn around it.

Felver and Wisroth pride themselves on creating original patterns and designs. They display a basic set of 15 patterns which show what can be done with this type of weaving. No designs are repeated.

Usually, the decorator brings his color scheme to the weavers, tells where he intends to use the draperies and shades, and indicates how he plans to use them. Then Vic Felver, with an assortment of yarns and sample woods, works out a basic pattern. Usually the final pattern is the result of both his and Wisroth's ideas. They work strictly as a team. Once approved, the pattern is set up on the loom and the work begins. It takes from six to eight weeks to make a normal delivery.

Not only palm fronds, but woods from all parts of the world are now used by the weavers. Much of the wood is bamboo from Japan, which is bought in the form of Oriental window shades, and then cut apart to get the wood strips. Oddly, this is less expensive than buying the bamboo in bundles.

In their list of materials are such items as horsehair from France, willow from the Argentine, banyan roots and the hearts of young cabbage palms.

Some of their weaving is with natural-

Matchstick bamboo used in making Christmas tree was first woven, then twisted into three basic shapes



color woods, but the majority of the woods are first stained or painted by an outside firm. Many of their yarns are purchased already dyed, although for special orders they think nothing of creating special colors in the tiny kitchen attached to their business place. Wisroth is in charge of all dyeing.

They're constantly seeking new ways of utilizing their process. They even made a Christmas tree—a white one—for a pre-holiday interior-decorators' dinner. They wove the special material of matchstick bamboo on their hand loom and then twisted it to form a five-foot-tall Christmas tree.

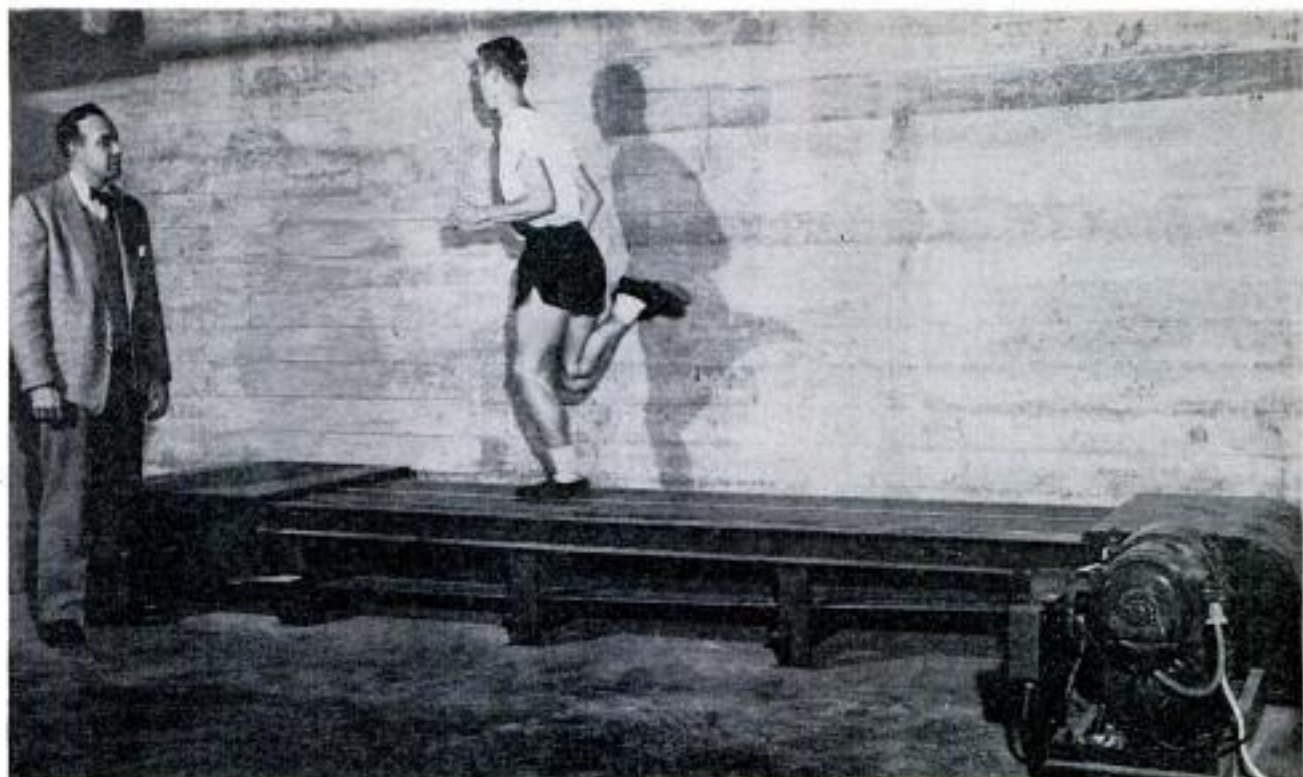
Another new product is a television lamp formed of woven wood.

In a short time they've seen their business develop into a profitable full-time enterprise, and they hope to expand it greatly. This doesn't mean, however, that they're going into mass production. The individual designs and patterns preclude such a possibility, and hand weaving is still a slow and exacting process. It isn't much faster in the 20th century than it was when first invented, and the looms have not changed basically since then.

Felver and Wisroth don't expect to become industrial tycoons. They'll continue to be satisfied with a thriving, unique and interesting business that enables them to live in a year-round vacation land. ★ ★ ★

Felver shows customer a sample of the weavers' work. Patterns are not duplicated; each is custom designed





Runners Practice Indoors on Conveyor-Belt Track

Runners at Northern Illinois State Teachers College now train indoors on a 12-foot-long rubber conveyor-belt track. Designed by one of the school's coaches, it can be regulated for practice at paces ranging from a very slow walk to a four-minute mile. The 24-inch-wide belt has a white stripe painted down the center and it runs over a heavy

flat-metal plate. The driving pulley is connected by means of a flexible coupling to an electric motor. The machine helps beginners learn proper running form by enabling a coach to be constantly at the runner's side to give instruction, as well as permitting distance-running practice in a limited space.

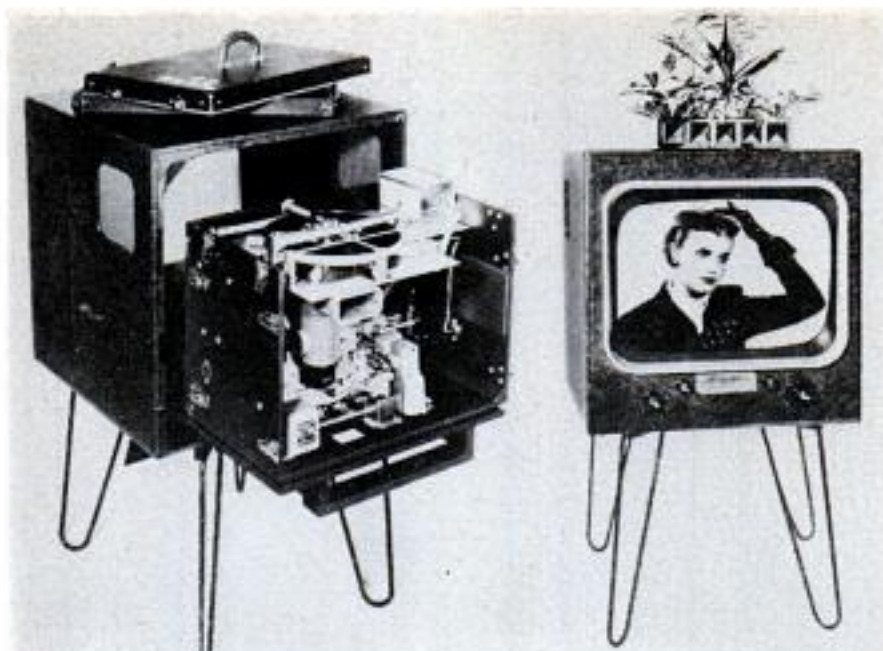
Discarded Metal Ribbons Form Decorative Grille

Discarded metal ribbons used to secure wooden crates for shipment are shaped into delicate scrollwork by Parisian Edmond Donzel. He changes the scraps of metal into lamps, gates and decorative flower containers. The designs were exhibited at the Paris Hobby Show.

Four-Day Mushroom

Rare European mushrooms that take a year to develop naturally are grown in four days in a Syracuse University laboratory. By growing the fungi in a nutrient-loaded liquid under constant motion, university scientists produce delicious pea-sized mushrooms in record time. The method is similar to that used to accelerate the growth of antibiotics. Frozen and reduced to a powder, the mushrooms can be used for soups and flavoring.



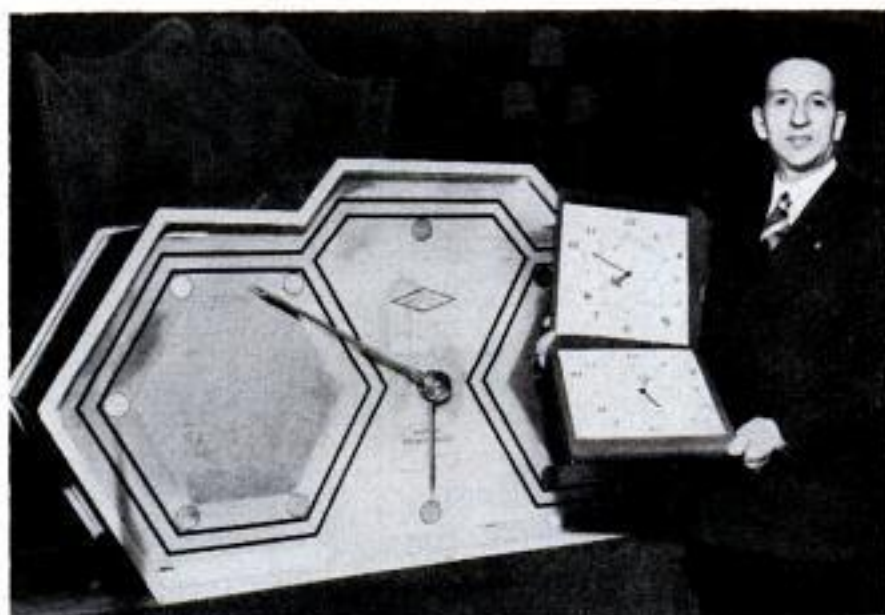


Movie Viewer Resembles TV

Salesmen, exhibitors and educators are using a motion-picture unit that masquerades as a television set. The self-contained, portable set shows up to 44 minutes of 16-mm. film, repeating it continuously for up to 200 hours with no rewinding. The pictures are flashed on a 13 by 18-inch screen by projection from behind the screen. Darkening the room is not necessary. The unit stops automatically if a splice comes apart.

Telescoping Hands Circle Odd Clock

Telescopic clock hands extend and contract as they circle the odd-shaped dial of a French timepiece. The inventor, Georges Gehel, designed the clock to free the clock-maker from the restriction of a round dial. Other Gehel designs include a clockface with the numbers arranged around the edge of an irregular leaf-like pattern. Here, too, the clock hands grow and shrink as the hours tick away.



80-Foot Water Tower Moved on Tracks

Towed by a Caterpillar tractor, a water tower rode 300 yards over a specially constructed track to its new location in England. The 80-foot-high concrete structure's short trip took four weeks. Faced with demolishing the tower and rebuilding it at a new location, or moving it, the ingenious contractors built a ball-bearing and concrete track using 200 2½-inch-diameter steel balls. Prestressed concrete beams made a "cradle" to carry the water tower.



Line Material Company photo

Low-Intensity Landing Lights Designed for Small Fields

Designed for farmers, ranchers and others with small flying fields, a new low-intensity landing-strip lighting system is easy to install. Single furrows four to six inches deep are dug parallel to and along both sides of the runway. Two lengths of wire are laid in each furrow and wood mounting columns for the lamps are driven into the ground at 200-foot intervals. Green threshold lights are installed at right angles to the runway lights at both ends of the runway. A breakaway groove and disconnect devices on the lamp wires minimize damage if a plane strikes a lamp.



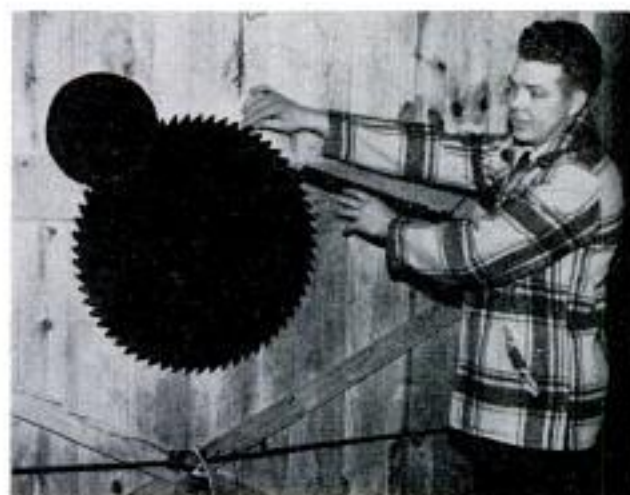
Cart With Four-Wheel Drive Totes Worker and Heavy Load

Rolling through the avocado groves of California is a miniature cart that will travel across almost any type of terrain. The little cart, powered by a 3½-horsepower gas engine, is maneuvered between the trees to carry the avocados. It has a four-wheel drive and four-wheel brakes. The operator steers it by braking the wheels on one side or the other. The cart, which weighs 170 pounds, will climb a 30-percent grade and will carry a 200-pound load in addition to the weight of the driver, who stands on a platform and drives the machine with two foot pedals.

Huge Clock With Wooden Wheels Decorates Garage Door

Neighbors of Clifford Cattell can tell what time it is by glancing at his garage door. Cattell of Adrian, Mich., built an eight-foot wooden clock to adorn the front of the door. A clock designer by profession,

he decided the white panel needed something to brighten it up so he built the clock face of wooden strips. Two wooden wheels, cut to an exact ratio, operate the hands driven by a small electric motor.



WHAT'S NEW FOR Your Home



2

1. LAUNDRY CART saves work and lifting, can be quickly disassembled for compact storage. Tubular-metal stand rolls quietly on plastic wheels, holds a cloth or wooden basket



1

2. SELECTIVE SPRAYER waters a 30-foot circle or any part of that circle. Four stationary petals hinge up or down to deflect spray from head. Sprinkler can water a straight strip, a corner, a half circle, spray in one direction only or serve as a fountain soaker

3. KNITTING MACHINE takes up to 164 stitches in one sweep, will turn out anything that can be knitted by hand in a tenth of the usual time. Yarn is simply fed over the extended needles with one hand while other hand moves handle across machine. Weight is 13 pounds



3





4. PERISCOPE in gas range enables you to see into oven without opening door. Viewing window at back of range shows progress of baking. Because oven door is not opened, constant oven heat is maintained, cooking odors are minimized and kitchen remains cool

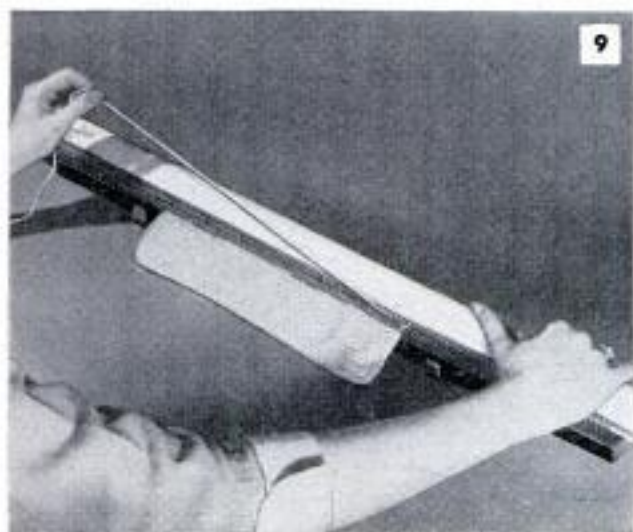
5. RANGE TABLE mounts two 1100-watt hot plates in its top. Asbestos-lined cover fits over heating elements when meal is cooked. Two double benches are suspended beneath table when not in use. Three-speed hot plates are regulated for 1650-watt top demand

6. FLAVORING NEEDLE injects sauce, seasoning or other fluids into meat, fish, vegetables or baked goods. Several injections prior to cooking result in even distribution of the flavoring throughout the food. Device is plastic with stainless-steel needle

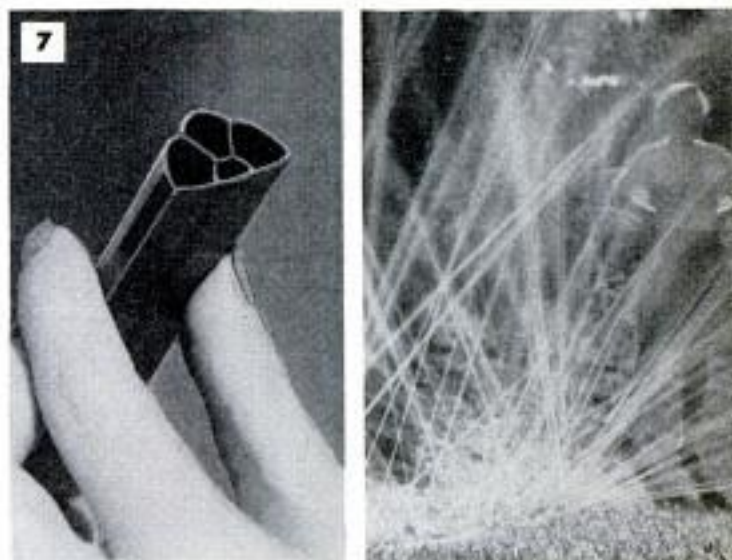
7. SPRINKLER HOSE divided into four channels has uniform water pressure throughout. Water flows through center tube to end of hose and back through perforated channels. Extra lengths may be added to the hose, which serves as a soaker when inverted

8. COFFEE KEEPER in a new refrigerator is made of transparent plastic, delivers measured quantities of coffee into pot at push of button. Crystals in container absorb excess moisture. Refrigerated coffee stays fresh up to three times as long, it is reported

9. MECHANICAL KNITTER somewhat similar to machine on opposite page, but introduced by another manufacturer, is low in price, knits almost any garment in record time. Plain stitches and a wide variety of fancy stitches can be knitted with it



JUNE 1954



105

The true test of a car begins when the owner takes the wheel. *Popular Mechanics* asked Buick owners from coast to coast about their cars. Here is what they say



Wrap-Around Windshield

"Never have I enjoyed such scenic riding. Blind spots are eliminated."
Salt Lake City, Utah, civil servant

"Left-side visibility hampered when turning left unless you lean forward. New post location where vent pane used to be."

Superior, W. Va., clerk

"Excellent, except in a storm. When they invent wipers to go around corners, they'll have it made."

Charleston, W. Va., salesman



Body Styling

"I like the Riviera. Don't care too much for four-door sedan. Too boxy."

Reno, Nev., superintendent

"It looks beautiful from the front and side. Rear looks a little broad."

Leoville, Kans., farmer

"It gives the car a European sports-car look. Makes it look futuristic."

Jersey City, N.J., foreman



Engine and Performance

"Get-up-and-go from standstill or from any given speed below 60 is great."

Detroit, Mich., clerk

"Very fast pickup. A little noisy, especially when cold. Could provide better gas mileage."

Chicago, Ill., farmer

"I have tried car on most types of roads and at speeds in excess of 100. In all ways it is very satisfactory."

Tyler, Tex., contractor

By Floyd Clymer



OWNERS PRAISE BUICK STYLING AND WRAP-AROUND WINDSHIELD

BUICK RAISED its fenders, lowered its roof and came up with an all-new body for 1954. Almost without exception, Buick owners in the PM Poll are pleased with the results—92 percent like the new body, 5 percent are undecided, only 3 percent dislike it.

"Smart looking. Has room and comfort inside with sleekness outside."—Claymont Heights, Del., research worker.

"It's lower with less chrome."—Lead, S. D., gold miner.

"Real artistry in this design."—Midland, Tex., physician.

"Looks like a dream car. I like the large trunk and rear-wheel cutouts on my Riviera."—Chicago foreman.

"Beautiful from the front and side, rear looks a tiny bit broad."—Leoville, Kans., farmer.

"Reminds me of the old electric cars. Top looks chopped off in front."—Covington, Ky., typographer.

"Don't like the hump on top of rear fenders."—Warren, Ark., sales manager.

Wrap-Around Windshield

Most noticeable feature of the Buick styling is its wrap-around windshield, and 89 percent of the owners call it excellent. Rumors that the new windshield will crack when the car is jacked up seem to have no support in the owners' experiences. Only three owners said their windshields had cracked and none said the cracking resulted from jacking up the car.

"Excellent. Affords more visibility to the sides. Helps you look up side streets."—Jersey City, N. J., foreman.

"Blind spots are completely eliminated. Other cars make me feel penned in."—Salt Lake City, Utah, clerk.

"Many rumors about windshield breaking when jacking up car by either bumper are mere rumors. We raise them up in the shop from all angles. So far no bad results."—Phoenix, Ariz., body man.

Here are the reports of the three owners whose windshields had cracked:

"Windshield cracked when I went over a very rough dirt road."—Albany, N. Y., counselor.

"Windshield cracked due to stress."—Washington, D. C., auditor.

"Windshield started to crack on the left

upper corner two days after I purchased the car. The crack has traveled about six inches downward."—Los Alamos, N. Mex. fireman.

The only other complaint about the new windshield concerned the inadequate coverage of the wipers.

"Wipers should extend farther. When mud is on windshield vision is narrower than before."—Syracuse, N. Y., manager.

Perhaps the wiper deficiency can be eased by adjustment as this owner writes:

"Minor windshield-wiper adjustment overcame vision deficiency."—Edgewood, R. I., superintendent.

Owners Praise Comfort

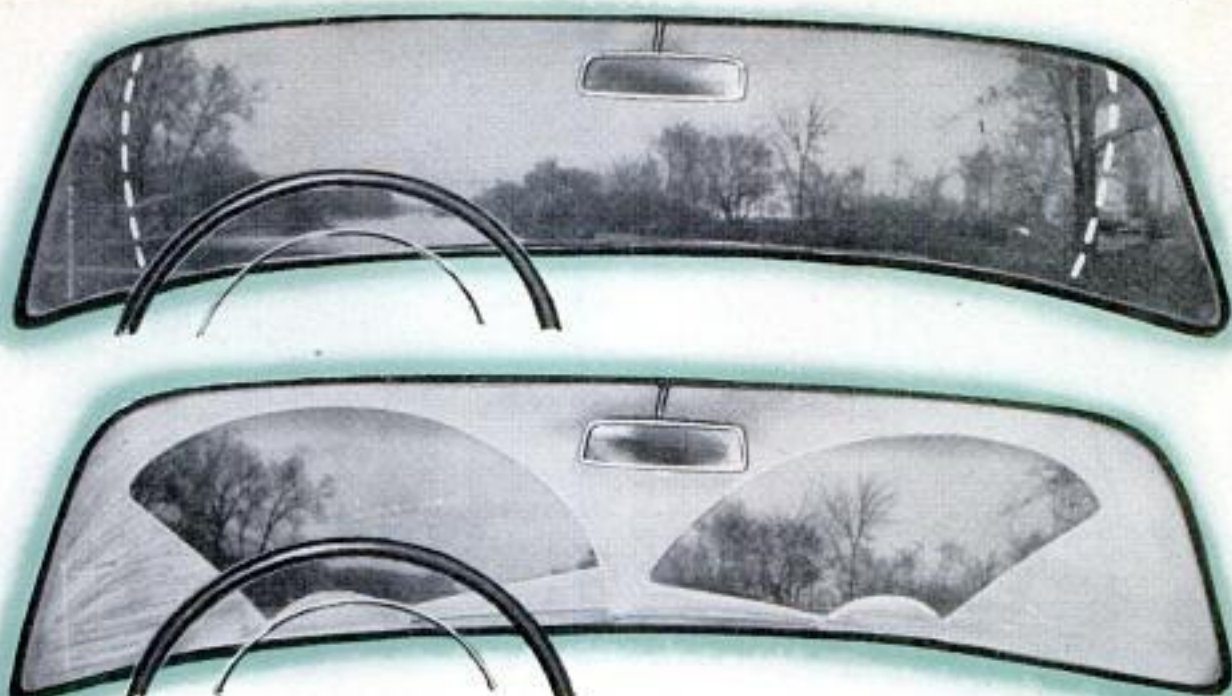
The most popular single feature of the Buick is its comfortable ride, the survey shows. In every series but the Super, more owners listed the ride as their best-liked feature than anything else. Among Super owners only, comfort was second to performance and power.

"It is the only car I have owned in which I can drive hard all day and not be all fagged out."—Detroit, Mich., engineer.

"I drive about 40,000 miles a year. Buick

Front doors have an unusual shape due to the windshield design. Owners praise the added visibility





Vision through wrap-around windshield is great. Dotted lines show usual windshield outline. But when covered by snow or mud, glass has large blind areas as lower photograph shows

"Steering column shakes. Rattles. Gas line leaks. Speedometer cable broken when I got it."—Camden, N. J., chipper.

"Have had minor troubles with all the electric circuits under the dash. Factory was careless."—Cullman, Ala., surgeon.

"Lot of loose body screws causing noisy rattles. Gas-feed linkage rattles. Doors exceptionally noisy on rough roads. Paint is thin."—Blackfoot, Idaho, manufacturer.

"Signal-indicator lever coming loose. Power seats stalling. Worst complaint is the wind that leaks through upper part of door in the corner next to windshield. Noise is terrific." -- Bell Buckle, Tenn., manufacturer.

"Evidently rushed along production line too quickly. Paint on dashboard beginning to chip."—Superior, W. Va., clerk.

But such complaints are from the minority. Most owners are pleased with their Buicks.

"My Buick got its 1000-mile checkup and the service foreman asked what I needed fixed or adjusted. I answered nothing." — Portland, Me., businessman.

Another complaint of the owners (and Buick owners are no exception) is poor gasoline mileage.

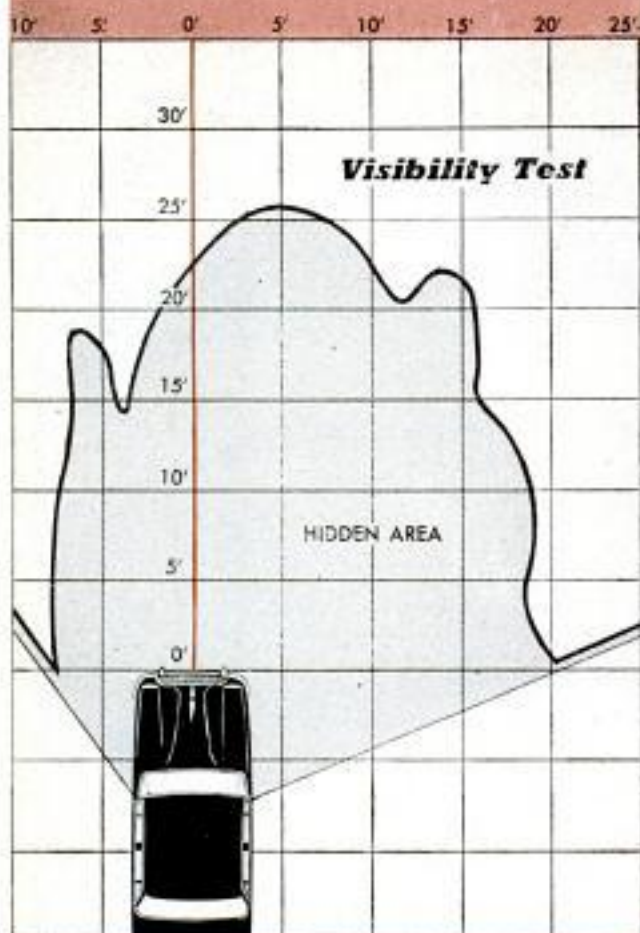
For average miles per gallon as reported by the owners see Percentage Table on page 108. Averages range from a high of 17.1 miles per gallon for the Special in country driving down to 12.7 for the Century in city driving.

"My Super gives fair gas mileage as long as it isn't hot-rodded. Fast getaways cut my mileage 2 to 3 miles per gallon."—Euclid, Ohio, buyer.

"Just last week I took first long trip of 900 miles on open road. Hit from 80 to 90 miles per hour. Took exact gas mileage for

Rumor states that the windshield will crack when car is jacked up. PM tried jacking all four corners of a Buick to limit of jack and nothing happened





Acceleration Test

1954 BUICK CENTURY 4-DOOR SEBAN
with Dynaflow

¼ mile from zero

18.8 sec.	Low and Drive
19.2 sec.	Drive only

½ mile from zero

30.9 sec.	Low and Drive
31.2 sec.	Drive only

0 to 30 m.p.h.

3.9 sec.	Low only
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0 to 60 m.p.h.

14.2 sec.	Low and Drive
14.8 sec.	Drive only

Top speed (by speedometer)..... 112 m.p.h.
Actual top speed about 8% less (speedometer error)

Economy Test

MILES PER GALLON
Constant-Speed Mileage

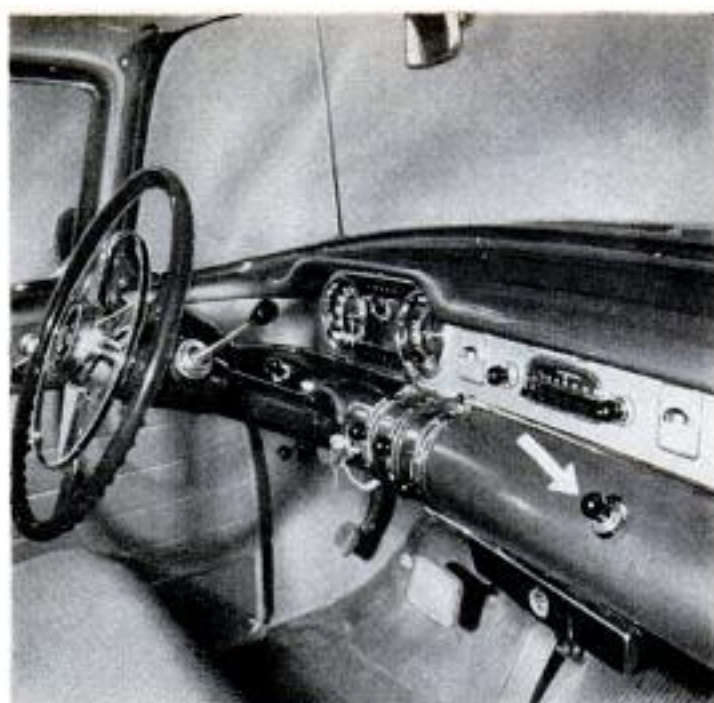
At constant 30 m.p.h.	21.1
At constant 50 m.p.h.	17.9
At constant 60 m.p.h.	16.1
At constant 75 m.p.h.	12.9

Cross-Country Mileage

Flint, Mich., to Springfield, Ill.	16.4
Springfield, Ill., to Kansas City, Mo.	16.9
Kansas City to Denver*	18.8

*Most of distance at speeds of 30-40 m.p.h. due to dust storm

* Each Owners Report combines two tests: (1) a road test by Floyd Clymer, famous automobile writer, who makes the performance tests shown above; and (2) an actual-use test by owners of the cars. Popular Mechanics sends out 1000 questionnaires to owners of each make of car surveyed and the responses are compiled and reported to you each month



Cigarette lighter protrudes from dash dangerously (arrow). It requires driver to have a long reach

my Super. It was 16.6 miles per gallon."—Reno, Nev., insurance man.

"Am hoping for more mileage. Right now I am dissatisfied with mileage of my Special but am not telling my friends about it! Get from 12 to 15 miles per gallon."—Manchester, N. H., retailer.

Handling and performance rate high with owners of the 1954 Buick.

"I have tried this Super on most types of roads at speeds in excess of 100 miles per hour. In all ways it has proved very satisfactory."—Tyler, Tex., contractor.

"Handles especially well on bumpy roads."—Great Falls, Mont., housewife.

"Have to watch the speed. I have considered installing a warning buzzer on my Super to notify me when I hit 65 miles per hour. I get to day dreaming and am running at 90 and that's too fast."—Haxtun, Colo., contractor.

"My Roadmaster comes nearest to winged flight at any speed of any auto I've owned."—Austin, Minn., physician.

What About Buick's Portholes?

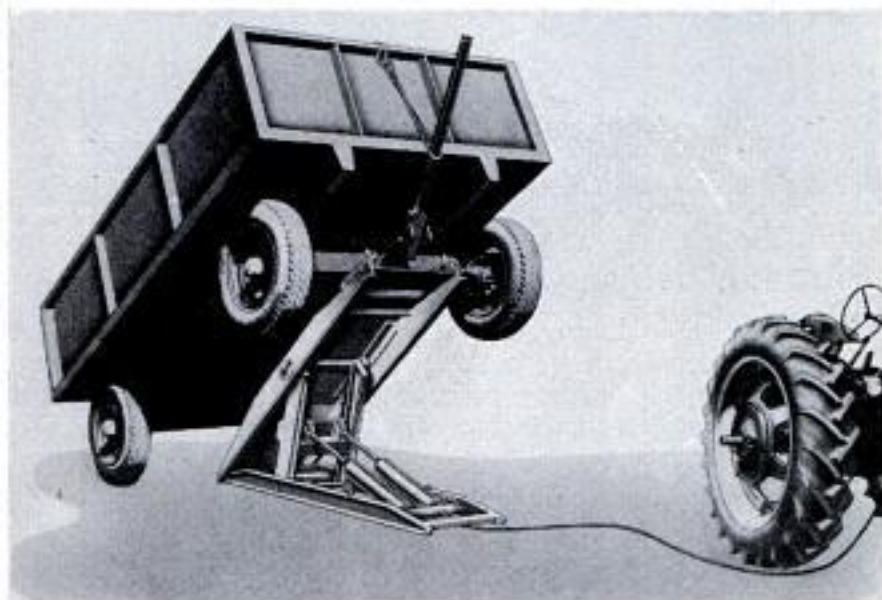
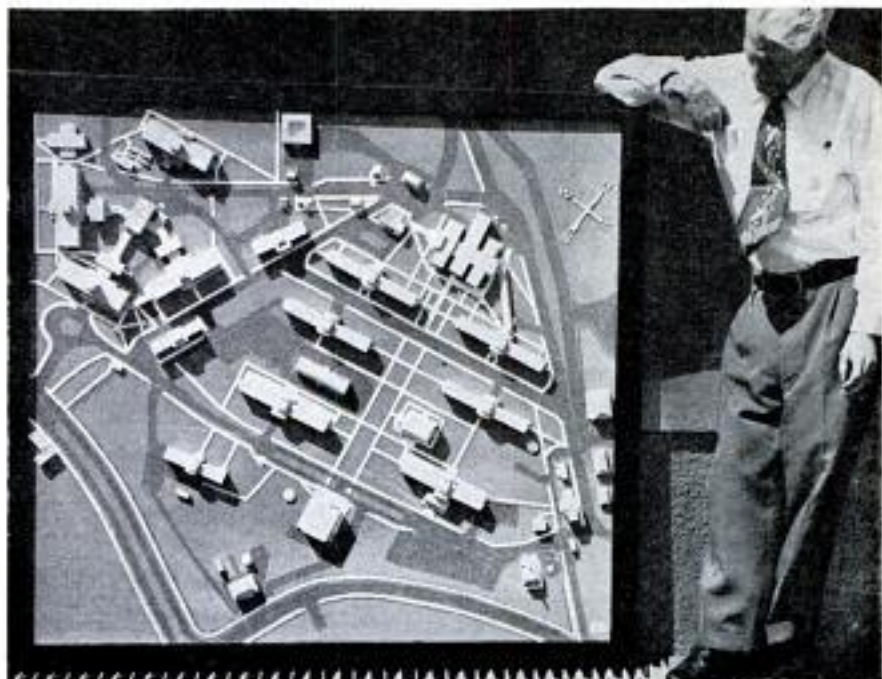
More interesting than important are the responses to the question about the familiar fender portholes of Buick. There is no question but that the majority likes them, but there is a surprising number who look upon them with indifference. Only 11 percent say they dislike the fender holes and 70 percent say they like them. But 19 percent don't care one way or another.

"Buick portholes are something different. Without them, a Buick wouldn't be a Buick."—Aberdeen, N. C., auctioneer.

(Continued to page 222)

Grounds Model Instructs Blind

Blind residents of the Sawtelle Veterans Administration Center in Los Angeles learn about their surroundings from a scale model of buildings and grounds. By feeling of the model layout they are able to learn the locations of the different buildings, and by tracing the miniature walks can tell how to reach various points in the center. Soon they can walk around by themselves, take their meals in the dining hall and go to the store.



Hydraulic Hoist Dumps Wagons

Farm wagons or trucks are dumped by a new double-cylinder hoist that operates from the low-pressure hydraulic system of a tractor. In its closed position, the hoist is only eight inches high. The loaded wagon or truck is positioned with its front axle over the lifting end of the hoist. A flexible hose connects the tractor and the hoist. The load can be lifted to a height of 54 inches.

Four-Wheel Steering Permits Bigger Loads

Trucks will carry heavier loads with less damage to highways when equipped with tandem front wheels, both sets of which steer. The additional axle on the front permits an increase in load without exceeding state limits. The axles are mounted on rubber paraboloids instead of on springs. The dual-tandem steering system is said to prevent jackknifing when used for semitrailer tractors and to give increased braking power.





U.S. Air Force photo

Mammoth Transport Plane Must Duck as It Enters Hangar

Getting giant Douglas C-124 Globemasters into a hangar at Elmendorf Air Base, Alaska, seemed impossible—the tip of the plane's tail is 48 feet above the ground and the hangar door was only 38 feet high. But the problem was solved by pulling the tail

down, inserting a wheeled frame under the nose wheels and lowering the main landing gear before the craft was towed into the hangar. Clearance: six inches. It takes six men about 40 minutes to place the big plane inside the hangar.

Double-Deck Transport Van Carries Six Small Trucks

Big van has two decks to carry small trucks from the assembly line to dealers in Germany. Each deck will carry six of the trucks. The van is completely enclosed for weather protection of the vehicles inside



Prefabricated Building "Blocks" Simplify Wooden Construction

Low-cost walls and windows can now be installed with as much ease as stacking blocks. The "blocks" in this case are interchangeable wooden units 4 feet wide, 2 feet 4 inches high and 4 $\frac{3}{8}$ inches thick. Three types are made: Solid wall blocks, ventilating units with louvers on the outside and a removable screen and drop-down door on the inside, and a double-thick window unit. Inserted splines make the self-supporting wall watertight. No studs are needed. Units are assembled with a screw driver and screws.



Mulch Blower Protects Soil

Newly seeded areas are protected from erosion by a spreader that covers the ground with asphalt-laden mulch. Drawn behind a truck, it is powered by a separate gasoline engine and is equipped with a blower. An eight-foot discharge spout can be directed over a large area. Fertilizers, insecticides and herbicides can be included in the mulch.

Video Microscope Counts Blood Cells

Television now is counting blood cells for medical laboratories. A small industrial television camera peers through a microscope at a blood sample mounted on a slide. A simple computer analyzes and counts the television pulses to give the number of cells on a dial. A television screen makes it possible for the laboratory technician to focus the microscope.

☐ The wings of a jet bomber could support a stack of cars as high as Washington Monument.





Backing up through a zigzag course without hitting a single pylon takes skill and a keen sense of timing

HIGH SCHOOL ROAD-DAY-O

AT THE RODEOS a broncobuster is encouraged by yells of "hold 'im, boy, hold 'im!"

At the Road-Day-O in Los Angeles his counterpart hears cries of "cut it sharp, kid, cut it sharp!"

The Road-Day-O, a tricky driving contest for high-school students, covers a series of tests that would dismay an adult motorist.

Car is now moving 25 miles per hour and the test is to stop it as close to the numbered line as possible

For example, to prove his ability to hold to a straight line, the Road-Day-O contestant must drive the car forward and backward through pairs of tennis balls separated by little more than the width of a tire.

Other problems include weaving a car through a maze of thin wooden poles, bringing the car to a stop on a white line from a speed of 25 miles per hour and then

This contestant did well in the stopping test. An official measures the distance from bumper to line





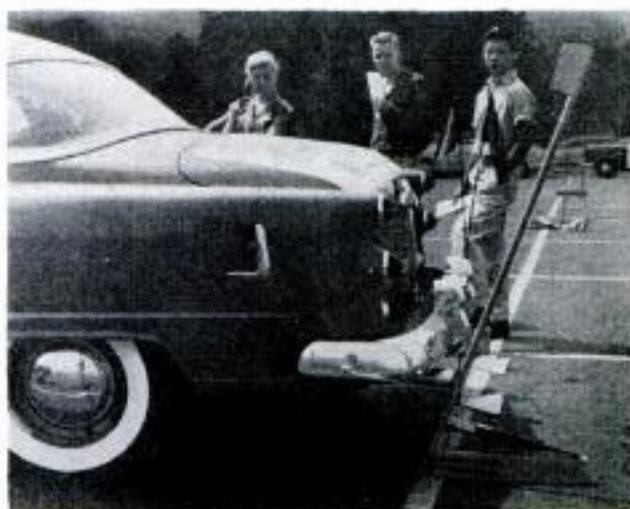
No cinch is this test! Object is to back the rear wheel between the two tennis balls without touching them

backing through a zigzag line of pylons.

Sponsored jointly by the Y.W.C.A. and the Los Angeles Junior Chamber of Commerce, the Road-Day-O attracted more than 500 entrants. Written true-false quizzes and preliminary driving tests narrowed the field down to 50 finalists.

Particularly gratifying were the high scores of those students who had received behind-the-wheel driving instruction at school. Although general driving instruction—mostly on rules of the road—is mandatory in California public schools, behind-the-wheel coaching is still limited by lack of funds. However, a state law earmarking part of all traffic fines for driver education will soon provide the means for greatly expanding the program. ★ ★ ★

Driver must park the car in this simulated parking space. Here the car ended up too far from the curb



Above, points are lost if the driver bangs into the "car" behind when he takes the parking-space test

Below, the poles mark off a zigzag maze the driver tries to navigate without knocking down any of them





Young Sailors Operate Hand Cranks to Turn Paddles on Boat

Operated by "kid power," a small boat glides across the surface when two paddle wheels are turned. The boat is 8 feet long, 42 inches wide and weighs only 35 pounds. The paddle wheels are mounted in the oar-

locks. The youngster cranks two handles on the shafts. The two shafts are connected by a piece of tubing, permitting the skipper to maneuver his craft by cranking only one of the wheels at a time.

Coded "Echo" Identifies Aircraft 200 Miles From Transmitter

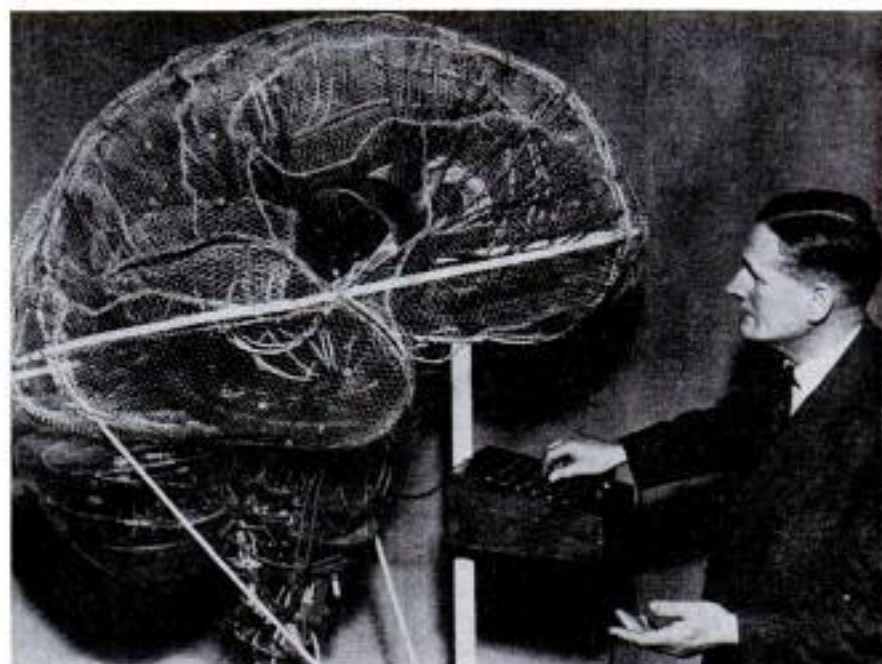
Faster, surer identification of aircraft is possible with a new system that supplies a coded "echo" of the ground-radar beam. Advocated by the Radio Technical Committee for Aeronautics, it requires installing in aircraft a beacon that returns a strong echo after being triggered by the beam. The reflected radar signal now used

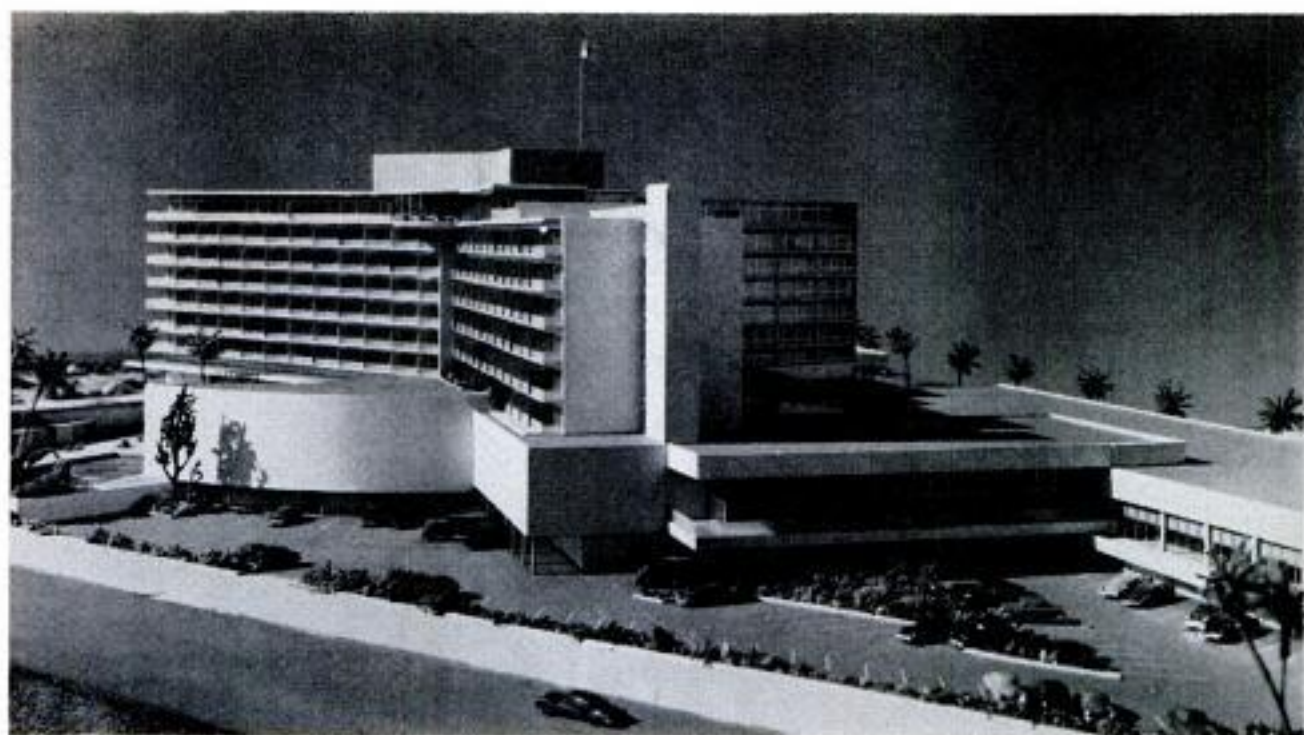
is often very weak. The new equipment has a working range of more than 200 miles from the airport's radar transmitter. An airplane entering the search-radar field at this point can be identified and tracked to within a mile of the airport. On entering the radar range an airplane is assigned one of 10 codes to use until it lands.

Plastic Model of Brain Contains Hundreds of Electric Lights

Five hundred electric lamps and a mile of wires and cables are used to illuminate different areas of a huge plastic "brain" designed for instruction purposes. Built at the Vienna Technological Museum, the Plexiglas model duplicates the convolutions of the human brain. A push-button switchboard controls lighting.

¶ As many as 2000 tropical fish can be shipped in a plastic sack devised by KLM Royal Dutch Airlines. The container weighs less than one pound





Model of Beverly Hilton Hotel, which will include a TV transmitting station and closed-circuit TV in every room

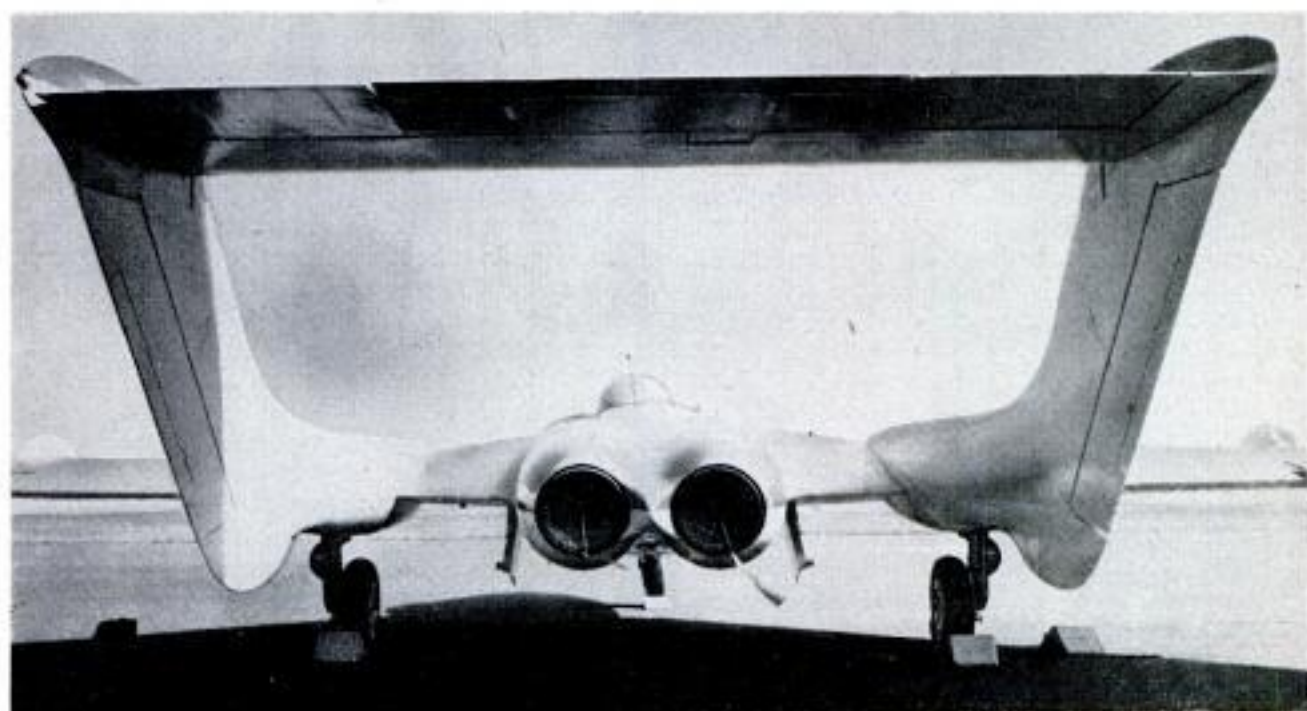
Hotel Built for TV Age Makes Full Use of Closed Circuit

Guests at the Beverly Hilton Hotel, nearing completion in Beverly Hills, Calif., will be able to flip a television switch in their rooms for a peek at the hotel ballroom or the main dining room. Over the same closed circuit they will receive weather reports, special announcements and movies. In the ballroom will be a theater TV screen for regular network programs. The same

equipment will be used for closed-circuit conference telecasts, originating in other parts of the country and carried to convention rooms in the hotel. Entertainment programs originating in the hotel will be beamed via a roof-top antenna to national TV networks. The same antenna serves as a master aerial for receiving telecasts over standard television channels.

Stereopticon or Cannon? No, It's a British Jet Fighter

Appearing to be an elaborate twin-barreled cannon or a modern stereopticon of giant proportions, this is actually a rear-end view of a De Havilland 110 jet fighter. It is under development for Naval use





Any day now you may see a strange craft take off like a helicopter, drive forward like an airplane. In factories from Long Island to Los Angeles, engineers are racing to be first with this new breed of aircraft

HERE COME THE

By Richard F. Dempewolff

YOU HOP IN the family aircraft on the back lawn, "rev" up the rotor and hoist yourself by direct lift to whatever altitude you desire. Then, disengage the clutch, shift to forward propulsion, and off the "flivver" goes at 200 or 300 miles per hour like a true airplane. At your destination you simply shift back to rotor, hover around until you spot a clear space no larger than the plane itself. Then tamp out your cigarette in the instrument panel ash tray and gently helicopter yourself earthward like an elevator settling to the ground floor.

It sounds like a dream for the year 2000 and perhaps it will be that long before your children and mine can actually buy and fly such wonder planes at a reasonable cost. But the craft itself—known as the "convertiplane"—is far from dream stuff. In aviation plants from the tip of Long Island to the Pacific Coast, practical aerodynamicists are juggling a wide variety of rotors, wings and propellers to achieve this kind of convertible aircraft. They're running wind-tunnel tests on aeronautical freaks that may start the flying world off in a new

direction. Ramjets, pulse jets, turbojets and piston engines are being tried alone and in combination on a large number of unbelievable configurations.

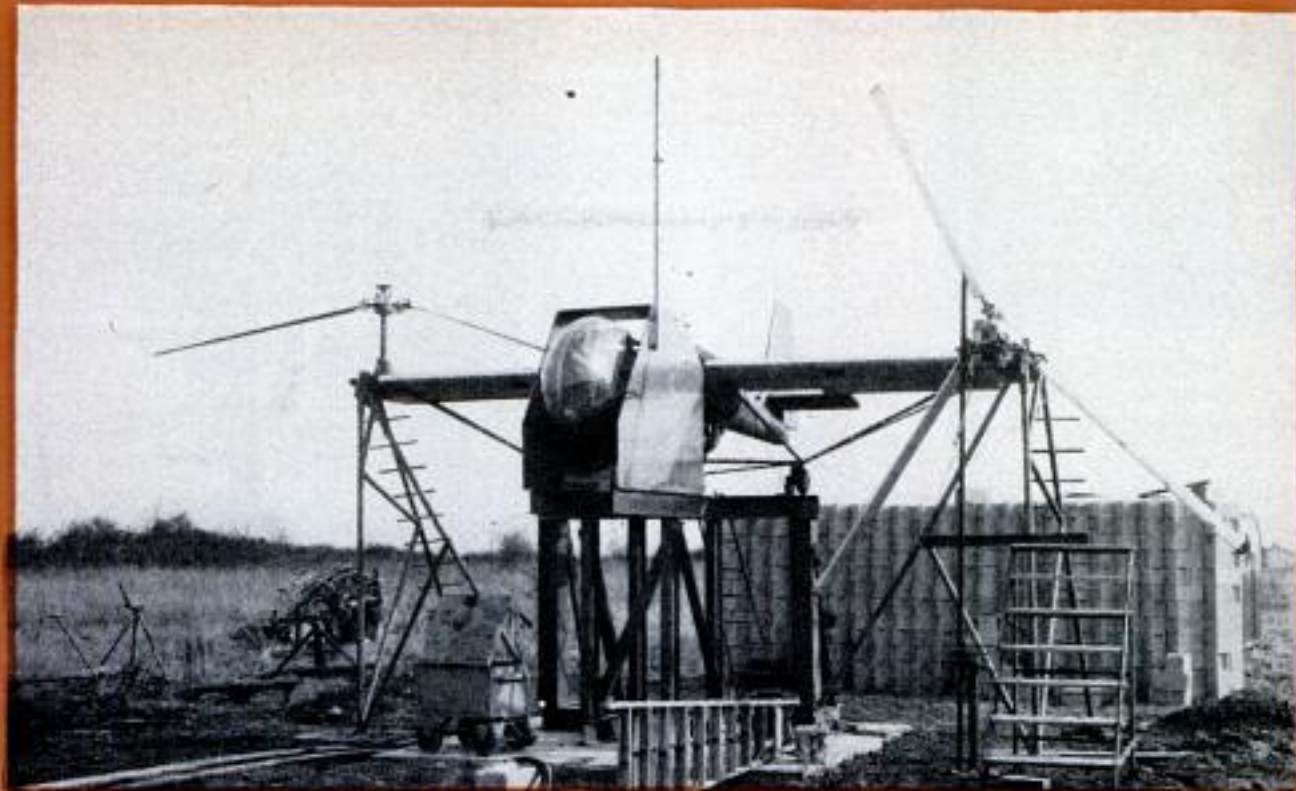
Two years ago, the Department of Defense, impressed with the helicopter's service in Korea but not content with its speed (about 150 miles per hour maximum), assigned convertiplane contracts to McDonnell for the XV-1, Bell for the XV-3 and Sikorsky. The "X" is for experimental, the "V" for vertical.

The rotor of the McDonnell XV-1, to be flight tested this summer, is powered by pressure jet units at the tips of its three blades. A piston engine supplies air to the jet during vertical flight and turns a propeller during forward flight.

Meantime, several privately built convertiplanes already have flown, other prototypes are built and are undergoing ground tests prior to flying this summer.

Convertiplaners argue spiritedly about the best way of achieving the craft's enticing possibilities and there are hundreds of fanciful ideas. Out behind a rented hangar





Transcendental's tilting-rotor plane is still undergoing ground tests, will probably take to the air this year.

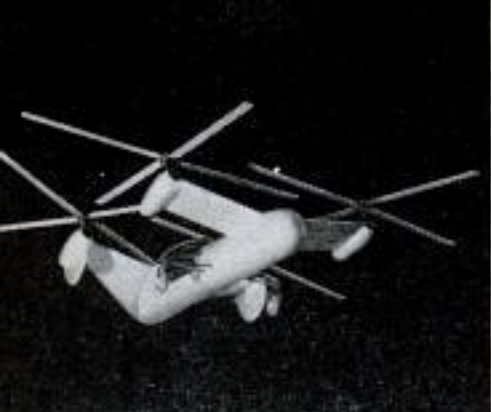
CONVERTIPLANES

Pivoting wings of Wayne University model are vertical for ascension and horizontal for fast forward flight

at Bellanca Airport, near Wilmington, Del., Bill Cobey and Mario Guerrieri of Transcendental Aircraft Corp. have been running ground tests for two years on a genuine convertiplane that looks for all the world like an overgrown dragonfly. The pilot sits in a big blister up in the nose. Behind him are the engine and transmission, shafted to a 15-foot rotor on the tip of each stubby wing. Working in counter rotation, they raise or lower the craft like a helicopter. Once in the air, the pilot shoves in the conversion control—a simple lever—and a pair of electric screw jacks slowly moves both rotors to forward position.—Presto! It's an airplane. To land, the procedure is reversed.

Cobey and Len Leone, president and vice-president of the company respectively, admit there are plenty of problems involved in this type of convertiplane and are in no hurry to take their craft off the ground until all tests are completed (probably this year). But they know what she'll do: "Everything a helicopter will do, plus 170 miles per hour in forward speed," says





Compound helicopter being built by Convertawings has stubby wings for lift in forward flight



Rotor of Herrick model becomes the main wing for forward flight



Army hospital plane has coaxial rotors, forward props on wings

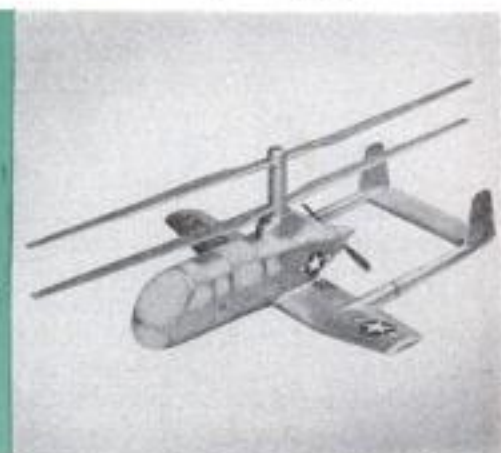
Single rear engine drives rotors of a pivoting-wing Convertawing



Tilting-rotor Bell plane being built for Air Force holds three passengers

John Zimmerman photo

Twin-tailed Gyrodyne model has coaxial rotors, pusher propeller



Cobey. "There will be no limit in a larger prop and piston-engine version. It will perform within 10 percent efficiency of any comparable-size airplane in forward speed and will handle a payload of 22 percent of its gross weight."

The Bell convertiplane for the Air Force, due out from under wraps this summer, is nearly identical with Transcendental's craft, only bigger, with seats for two or three passengers in its long, Plexiglas nose. Its wing-tip rotors hinge up and down in slotted, streamlined nacelles. Under its belly are three long skids in place of tricycle landing gear.

A great many tilting-rotor designs have been proposed by inventors—some in which rotors are stacked fore and aft, then convert so the front one hinges forward to become a nose propeller and the rear one hinges back to become a pusher-type, with blade pitch reversed. In others—such as a model produced at Wayne University, and the tiny Model B convertiplane designed by a company named Convertawings, in Amityville, L. I., two rotors jut like propellers from the leading edge of each wing.

When the pilot wants to take off, both wings swivel so the rotors face upward. Once in the air, the pilot tilts his wings back to normal airplane position and the rotors turn with them to become propellers.

Convertawings has no immediate plans for building the ship, but President Dave Kaplan can show you a handsome silver model of the two-seater design under development with a whirling-arm test stand.

Meanwhile, Kaplan and his men are building a fantastic-looking "Quadrotor"—a compound helicopter with four rotors in double tandem, stub wings and Jacobs solid extruded aluminum blades. "The Quad design," says Dave, "lets us use much smaller blades to work on the same air mass. It may point the way to huge transport helicopters with speeds competing with airplanes." The Quad should be ready this year, and after a spell of testing will be sold for crop dusting, or some similar duty, Convertawings hopes. If it works, and sells, they'll build a whopping quad transport and, perhaps, the little convertiplane sky flivver.

In case you don't care for old-fashioned piston engines in these planes of tomorrow, inventor Alfred I. Roman in New York can build just the convertiplane for you—if you'll put up the money. Sketches of Mr. Roman's brain child show a highly streamlined affair that looks like a supersonic jet fighter with rakish, swept-back wings. For vertical flight, the wings are tipped perpendicular to the plane and a battery of rockets on the wings' undersides whams it skyward. If you prefer something more leisurely, you might try

Roman's alternate version with jet-driven rotors on the wing tips. It works on the tilting-wing rotor principle.

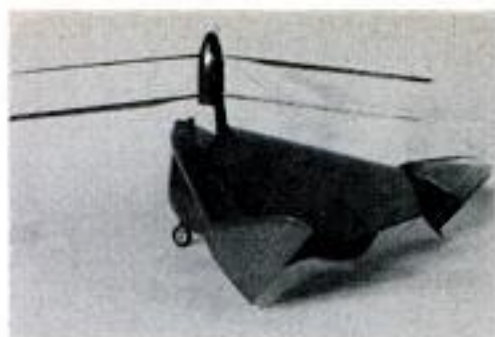
Of all the tilting-rotor-type designs, one of the most unique comes from California. At North American Aviation (which hasn't anything to do with the project), research engineer Frank A. Dobson and some fellow workers have developed a mosquito-like little delta-wing craft with two vertical fins and a pair of 16-foot three-bladed, contrarotating propellers on a single hub that juts from the nose. In this position, the tiny craft is a fast-flying (187 miles per hour) triangular affair powered by twin McCulloch engines whipping up 70 horsepower each. The plane carries two passengers and Dobson envisions it as a backyard family craft or a military liaison vehicle.

When Pop climbs in to take off, the craft sits on a pair of skids under its low aft end and swivel wheels under the nose. The hinged nose shaft is pointed skyward, with stacked rotors whirling in opposite directions. If Junior is hopping around, the thing won't take off but will pivot around on its skids until he climbs into the seat and the center of gravity is established beneath the rotor. Then, up she goes, nose high, like a helicopter. At proper altitude, the nose hub goes down and the craft zooms away at a 170-mile-per-hour cruising speed. To land, the process is reversed, and the craft helicopters to earth at a maximum forward air speed of 20 miles per hour.

At last report, Dobson and his friends were building a prototype. If it is successful, he expects to try a military type of jet machine that he believes will do 700 miles per hour.

Plenty of people in the convertiplane business think that tilting wings and rotors are far too complex and impractical. Even enthusiasts admit they pose terrific problems. Cobey and Leone smile when anyone talks about flying one this year. "There's a new vibration problem for every degree of tilt," says Cobey. He recalls wryly that, during an early tilt test, ground resonance (sympathetic vibrations that sometimes wreck helicopters revving up on the ground) set in and shook the little plane apart. Months were lost rebuilding it. "We admit our failures as well as our successes," says Cobey.

Other experts claim that a rotor makes about the



Rotors of Dobson Delta Wing tilt forward



Rotor blades of Gyroliner model telescope inward to reduce drag in forward flight

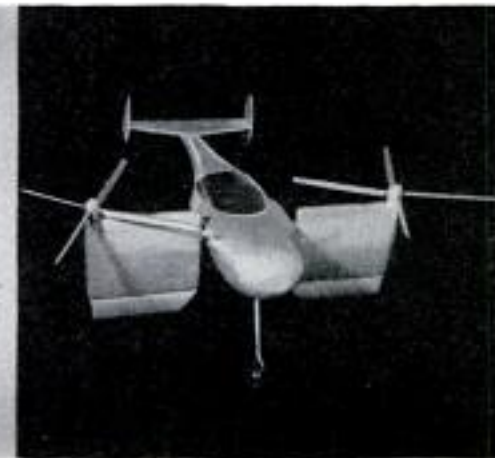
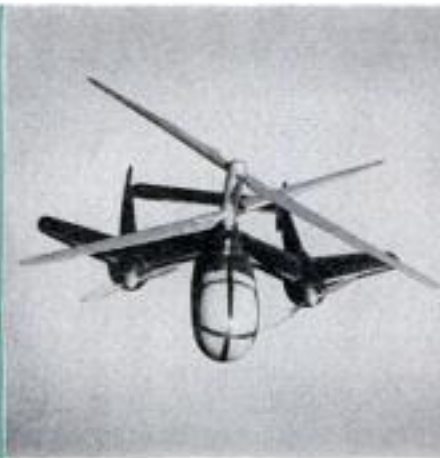


Rectangular ramjets on rotor tips work fine but waste fuel, Gyrodyne decided

Coaxial rotors of the Navy model fold for storage on carrier

Gyrodyne model has rotors and two forward piston engines

Pivoting-wing model shown on opposite page in position for vertical ascension





First U.S. military convertiplane is the XV-1, built by McDonnell. Pusher prop and rotor-tip jets power it

most inefficient kind of propeller man could devise. Many critics are not opposed to convertiplanes. They go for the type that has separate rotors and forward power units.

In St. James, L. I., Peter Papadakos, president of the Gyrodyne Company of America, has plans for a half dozen such convertiplanes. One is a 72-passenger Gyroliner, with two 88-foot, four-blade rotors that contrarotate like big choppers. Turboprop engines in the small wings provide forward speed as well as rotor power. She'll cruise at 230 and rise at 2350 feet per minute. Papadakos is confident his ship will perform, because he's one of the few people who have actually flown a prototype. It happened in 1951 when test pilot Jim Ryan buzzed around in Gyrodyne's coaxial helicopter, with a forward engine rigged on each side.

In Gyrodyne's models, the rotors go at all times. "They're under minimum power in forward flight just to offset drag," explains Papadakos. "The wings take much of the lift in forward flight."

The company also has plans for smaller craft with folding rotors for Navy ships, telescoping rotors for big liners and ramjet rotors for a military version. Some have two blades, some four. So far, none has been built, but the big Gyroliner is a special contract that may one day take to the air.

Convertiplanes in which the rotor is separate from the forward propellers can be fairly simple or ultrafancy. E. Burke Wilford, national chairman of the Convertible Aircraft Pioneers, is building a working prototype at Townson Field, near Trenton, N. J. He is simply putting a four-bladed rotor, driven by tip ramjets, on a modified Aeronca frame. He expects that his co-

worker and pilot, George Townson, will take off in it this year. The rotor will hoist the plane up, then go into free wheeling as the forward propeller picks up speed and wings take over the job of supplying lift. Hence, the craft will function as helicopter, autogyro and airplane in successive stages.

If anyone can fly it, Townson can. He made over 100 conversions in the granddaddy of all convertiplanes back in 1937. That machine, designed and built by the "father of the convertiplane," an inventor named Gerard Herrick of New York, president of the Convertiplane Corporation, was a tricky combination of low-wing monoplane with a free-wheeling, two-bladed rotor on top. When locked in position, the rotor became a fixed wing. Townson would take off like an airplane, release the rotor in flight and come down like a 'gyro. He could take off and fly like an autogyro if he chose. The craft could also be flown as a biplane, but had to start off as one since, in this test ship, there was no way to stop the rotor in flight. Just how fast she'd get off was demonstrated in one early flight, when unexpected vibrations worried Townson and he set her down in somebody's back yard. He made an adjustment, let the rotor spin and took off between two houses with inches to spare. "It was morning and folks were having breakfast," he recalls. "Often wondered what those people thought when that weird whirlybird skimmed past their breakfast tables a few feet away."

Today, a whiter-haired but still enthusiastic Herrick has a new design on the same theme, which he'd like to build. His slick wind-tunnel model resembles a Flying Boxcar with twin booms and tail fins. It has stubby underwings and a long, thin



Flying Magazine photo
Flying prototype of British Fairey Gyrodyne has two forward propellers on tips of stub wings and a three-bladed rotor



Wingless convertiplane flown two years ago by Gyrodyne was a coaxial helicopter fitted with a pair of outrigger engines

Mockup of convertiplane in Herrick's office is equipped with complete controls, revolving rotor head and forward propeller

Free-wheeling rotor on 1937 Herrick test plane paved way for powered rotors. Plane took off like biplane, landed like autogyro

upper wing suspended on a center shaft. Each side of the top wing can be tilted for pitch. The entire span can either be locked, permitted to spin freely like a gigantic pinwheel, or powered by ramjet on each tip. A pusher engine behind the cabin supplies forward speed once the craft is airborne.

In Herrick's office sits an odd mockup with rotor head and traction propeller—driven by electric motors—plus a complete set of working controls. "I take generals, admirals and industrialists for rides, so they get the idea," explains Herrick. A ride in the mockup provides a graphic experience. Standing by the controls, the

(Continued to page 210)





Automobile Stoplight Atop Antennalike Rod

Clearly visible in all directions, an automobile stoplight is attached to the top of a flexible rod that is mounted on the fender like a radio antenna. Not intended to replace the conventional rear-mounted stoplight, the signal light is hooked into the stoplight circuit. When the car is brought to a stop, the deceleration causes the rod to sway slightly, making the light very noticeable from all directions. A shield prevents glare from hitting the windshield.

Portable Air Conditioner Works in Car or in House

Cooling by water evaporation, a portable air conditioner can be used to cool your car while you drive and your home when you get home. The unit straddles the hump in the floor of the car and is plugged into the cigarette-lighter socket. The water tank holds 2½ gallons. An adapter is available to enable you to plug the unit into any 110-volt alternating-current wall socket at home.



POWER *from the* WIND

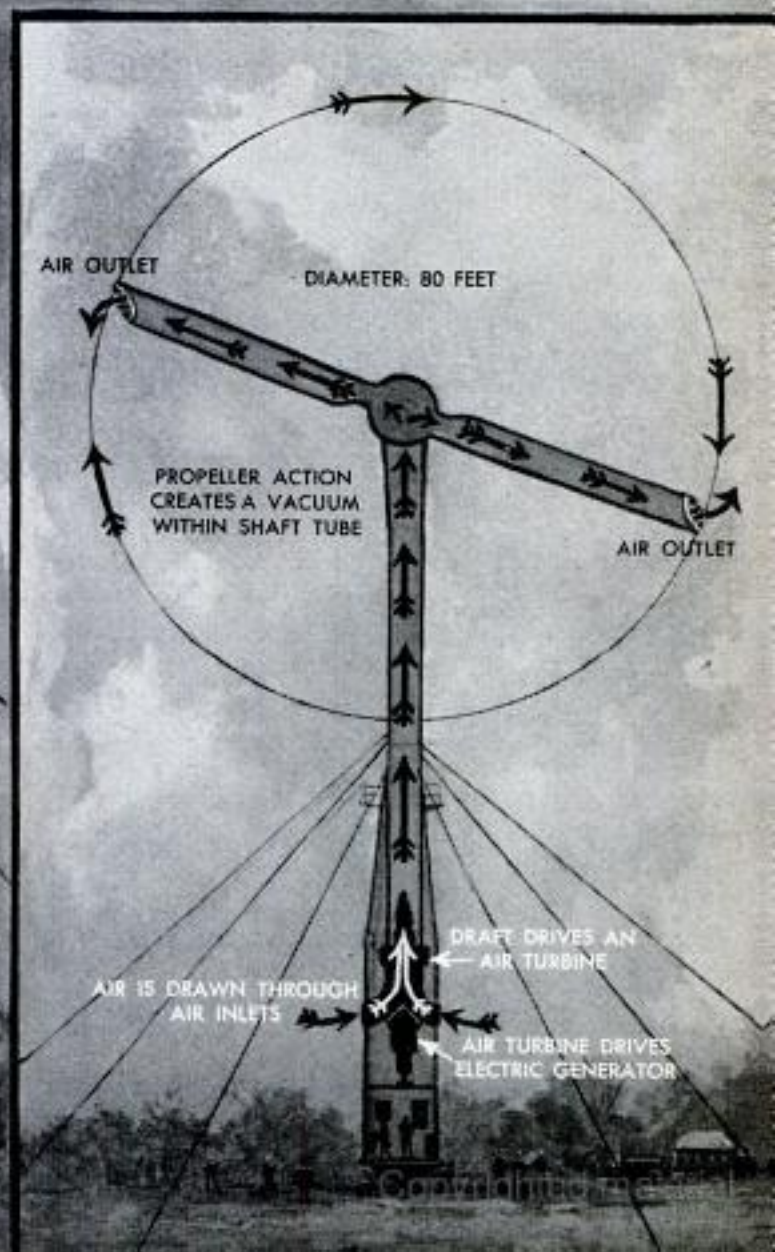
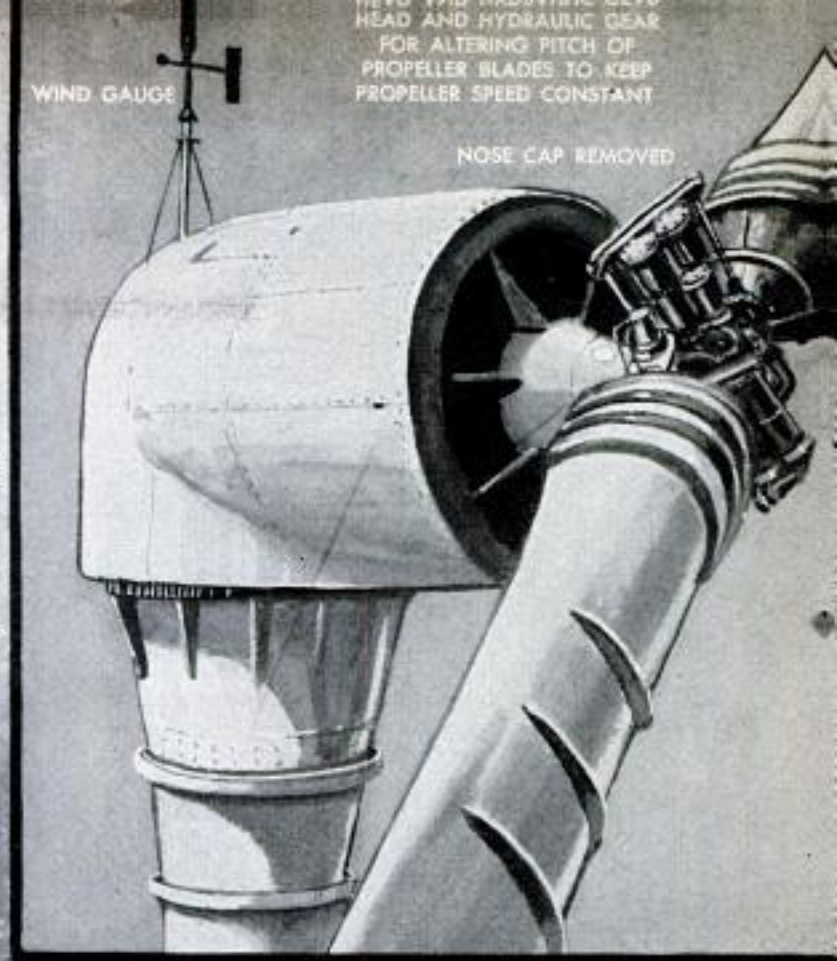
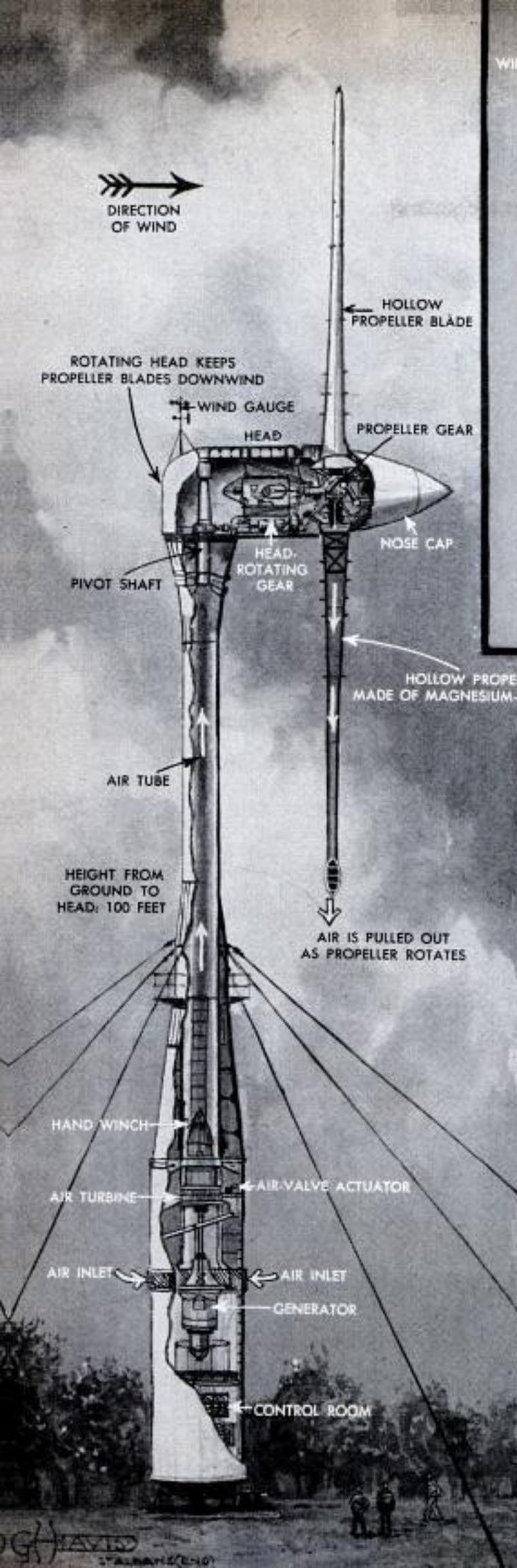
Drawn especially for *Popular Mechanics*
by G. H. Davis, noted English artist

ELECTRIC POWER is pulled from the breeze by an experimental windmill in Britain with two hollow, airplane-type blades. Unlike conventional machines, it has no coupling between propeller and generator.

Instead, air rushes up the hollow tower and exits from the tips of the whirling blades, creating a draft that drives an air turbine in the tower base. The turbine, in turn, drives an electric generator capable of supplying 100 kilowatts of electricity to the national power system.

The unique windmill consists of a cable-supported tubular tower 100 feet high, with a two-bladed hollow rotor 80 feet in diameter mounted on the head. At the tip of each blade, a few inches from the trailing edge, is the air exit. Vanes near the end of the blade direct the outflowing air. According to the makers, the centrifugal force caused by the rotation of the blades forces air out through the exits. This creates a vacuum in the tower, causing air to be drawn in through an inlet near the foot of the tower. The incoming air passes through a turbine that drives a generator. The advantage of this design is that the weight of the generating plant is not at the top of the tower. The rotor of the machine whirls at 95 revolutions per minute over a wind-speed range of 30 to 60 miles per hour. Hydraulic motors in the head vary the pitch of the blades to keep their speed constant. If the wind speed consistently exceeds 60 miles per hour, the blades are automatically turned edgewise to the wind. The blades are designed so that they can "flap" under pressure of heavy gusts instead of snapping. The natural tendency of the rotor to face into the wind is aided and controlled by a power-operated system. Operation of the wind generator is entirely automatic.

After tests at St. Albans, Hertfordshire, England, the generator was to be dismantled and erected permanently on the west coast of Wales. There it will serve as an auxiliary power station to reduce the load on coal-powered stations. Eventually, giant windmills of 2000 to 4000-kilowatt capacity may follow, for it is estimated that wind could yield power as cheaply as coal with an average wind speed of 20 miles per hour.





Wall of 2000 patterns was built around a terrace and steps. Each pattern consists of shale laid around a unique or colorful stone. Drainage holes keep wall dry



Stone wall around basement entrance blends it with stone-edged patio. Doors are painted to match stone

Wall just a few stones high keeps people off the grass and is a neat, attractive edging for sidewalk



Sandstone slabs top fuel-box tables of shale fireplace

STONE WALLS

By *Walter E. Burton*

MOST PEOPLE think of a stone wall as merely a "pie crust" to keep an earthen bank from throwing its weight around. But Ted Housley, of Munroe Falls, Ohio, often uses stone to add distinctive features to a home and at the same time solve a knotty landscaping problem.

Housley likes to combine stones in a wall to create pictorial effects. Selecting his stones for texture, shape and color, he lays them so that they resemble weird formations or familiar objects like a catcher's mitt or the head of a dog. In one wall he may create hundreds of these "pictures."

Low ring of stone surrounds stump that would have been costly to remove. Enriched soil nourishes flowers



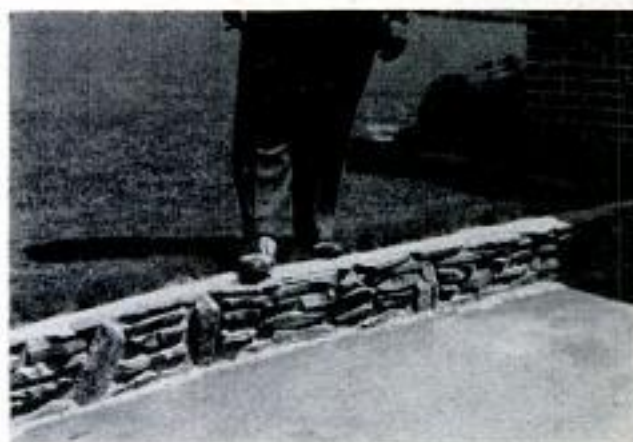


Trees left with roots exposed when lot was graded are saved by island of enriched soil encircled by stone wall

FOR YOUR GARDEN

Using shale, cut stone and "hardheads," he combines them in such a way that it's easy to spot a Housley wall.

He believes that homeowners should use stone more often than they do. A stone wall is just the thing, he says, to keep cars and people off lawns, to hold a terrace or to camouflage an unsightly stump. ★ ★ ★



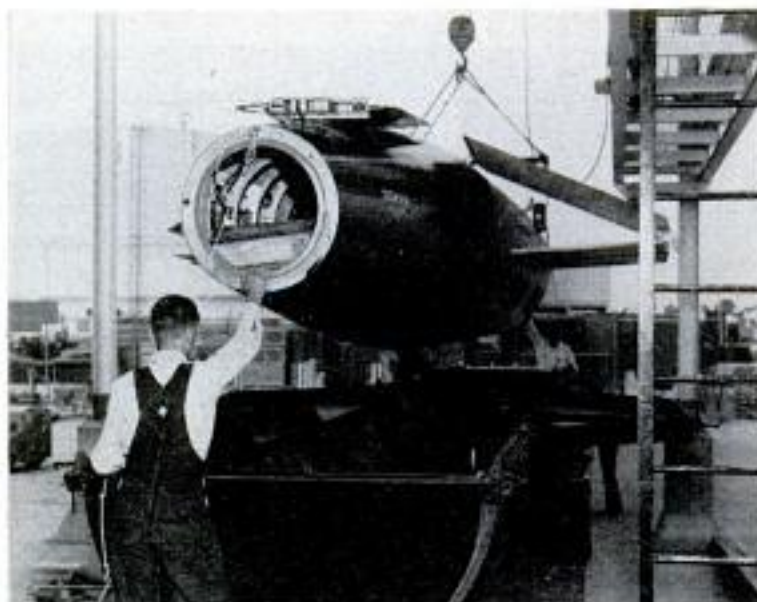
Driveway edging is flush with lawn for easy mowing

Steep backyard was made usable by splitting it into a series of level terraces held in place by stone walls





Chance Vought Aircraft photos



Build Special Trailer To Carry Bulky Missile

Design of a tilting container has solved the problem of trucking the Regulus, a new Navy guided missile, over public highways. Its 12-foot wingspread could not be transported on highways without special permits. Collaborating with Spencer-Safford Loadcraft Inc., Chance Vought Aircraft came up with a vehicle 45 feet long and eight feet wide, with a rotating shell into which the missile is lowered. After loading, the shell is rotated so that one wing descends below the trailer floor as the other wing rises.

Cleaning Rod With Many Tips Fits All Kinds of Firearms

Pistols, rifles and shotguns can be cleaned with a brass rod that breaks down into four sections and has five extension tips. A light-weight aluminum pistol-grip handle fits into a closed aluminum pipe which serves as a case for the kit. Length of the rod is 34 inches; weight of the kit is eight ounces. Its compactness and light weight make it suitable equipment on any hunting trip.

☞ Far more effective than a "no smoking" sign, an Austrian device actually detects smoke and shouts a recorded message: "A fire-raiser is smoking here."





Picker Pulled by Small Tractor Scoops Rocks From Farm Fields

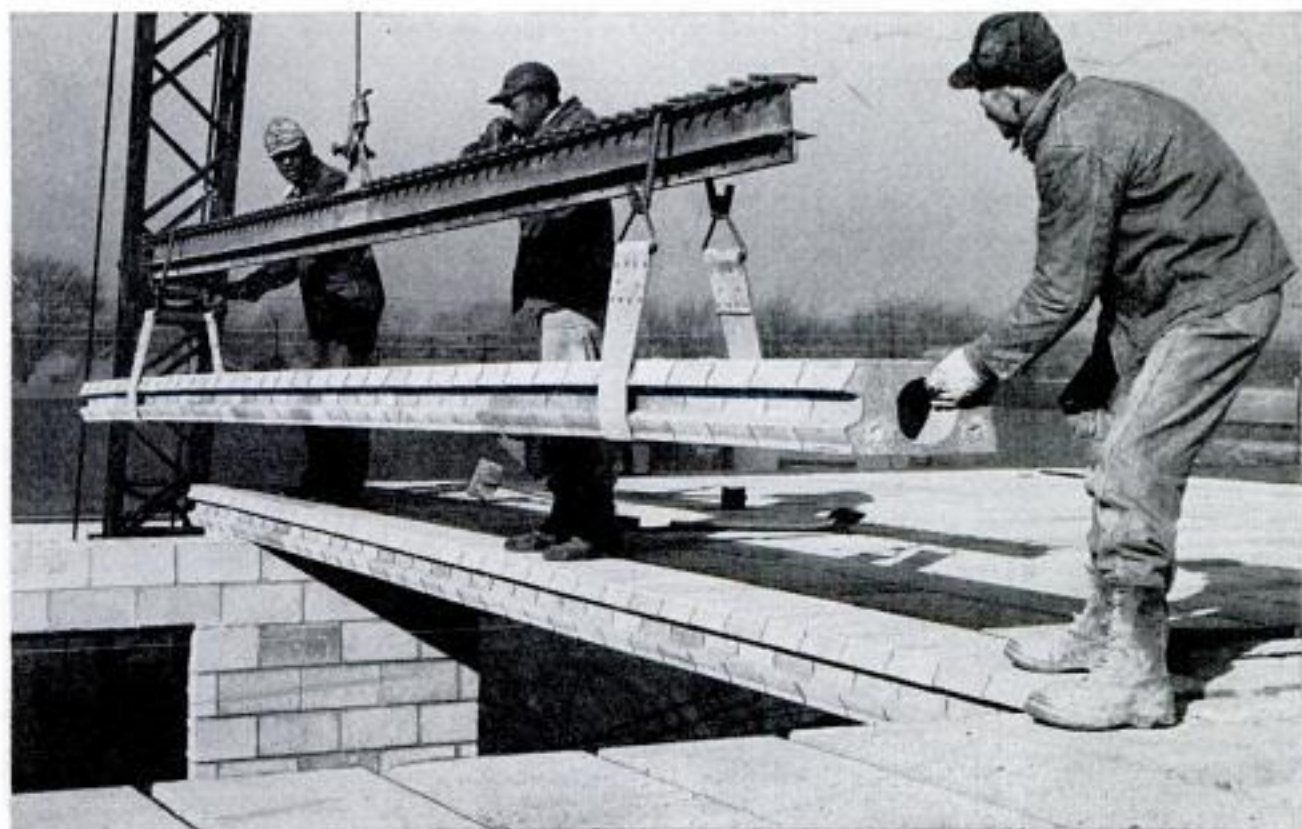
Rocks are picked from farm fields by a new hydraulic implement that can be pulled by a small tractor. The picker has adjustable tines that slide along the surface to collect the rocks. When the tine

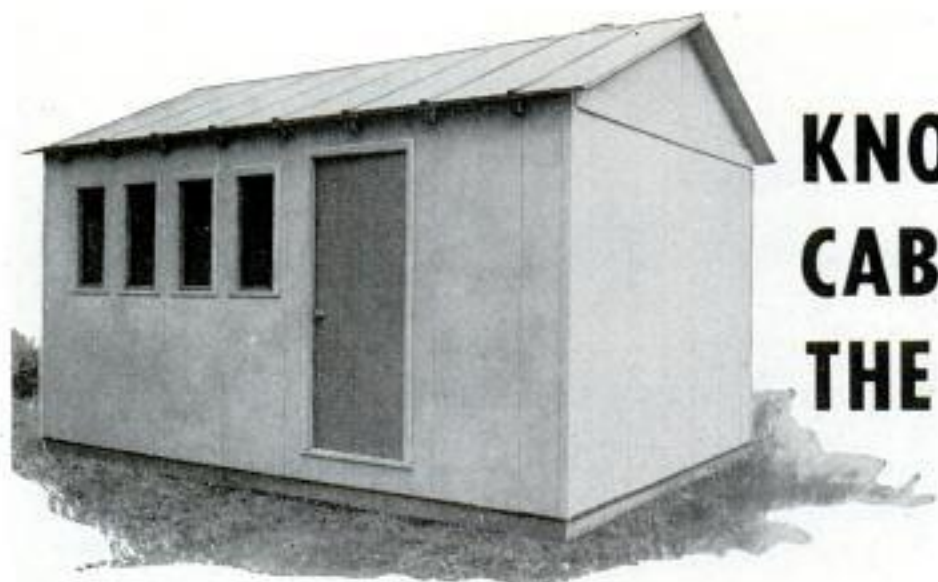
assembly has a full load of rocks, the operator swings it up and to the rear to deposit the load in a hopper. The hopper has a high unloading level to permit dumping into a truck or making a high pile.

Hollow Concrete Slabs Are Roof and Ceiling Combined

Ceiling and roof are one in a building topped with long, hollow slabs of reinforced concrete. The slabs are transferred from the delivering truck and positioned by crane in one operation. The topside, after grouting, is weathertight; the underside

can be painted and is sound-absorbent. Tongue-and-groove joints between slabs contribute to the strength of the roof, which contains steel reinforcing rods. The core holes serve as heat ducts, cold-air returns and concealment for pipes.





KNOCK-DOWN CABIN FOR THE WOODS

By Stanton H. Patty

Photos by Jan Fardell

YOU DON'T NEED a hammer, a nail or even a screw driver to erect a knock-down hunting cabin designed by the I. C. Colprons of Longview, Wash. Two persons can assemble or dismantle the prefabricated hut in a single afternoon.

It's almost as portable as a tent, for the entire unit knocked down can be loaded on a small truck and hauled from place to place. And, according to the husband-and-wife team who invented it and built a sample model, it can be raised without the use of a single tool.

Walls consist of vertical fir-plywood panels two feet wide that fit into each other like tongue-and-groove lumber. Bolts slip through and are held in place by unique

metal "keys." The completed cabin measures 12 by 16 feet, but it can be enlarged by lifting off one end and adding more panels of the same size. Panels with built-in windows and a double panel with a built-in door can be shifted around to vary the design of the house. Double construction permits insulation between the walls, in the ceiling or under the plywood flooring, and one-piece corners add strength to the building. Simple locking pins hold the rafters, floors, sills, windows and other parts firmly in place. There's even a metal chimney that can be connected to a stove, in case you decide to heat the place.

The maximum weight for a single piece of material is only 75 pounds and the long-

Dismantling the cabin, Colpron removes an end panel. Quickly removed roof panels rest against building

One-piece corner panels add strength to building. Panel edges interlock like tongue-and-groove lumber

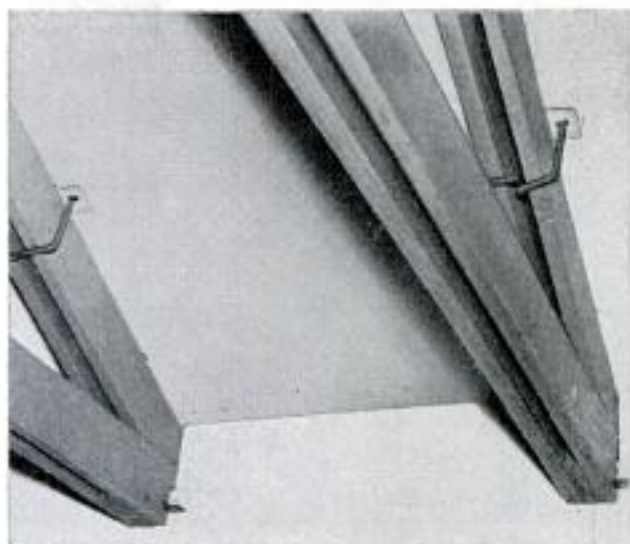




Bolts slip through predrilled holes and are held firmly with locking pins. Flooring is of plywood

est piece is 12½ feet. Total weight of the disassembled cabin is 3000 pounds; it can be transported either by a truck or by automobile trailer. Two moderate trailer loads can include all materials.

Colpron, who has filed a patent on the knockdown house, believes that it will be invaluable to hunters, anglers, contractors and logging-camp operators. It has the advantage of being not only portable but inexpensive. If many units were manufactured, a 12 by 16-foot house would sell for about \$1000. Although he's still working on his second model, Colpron dreams of large-scale production.



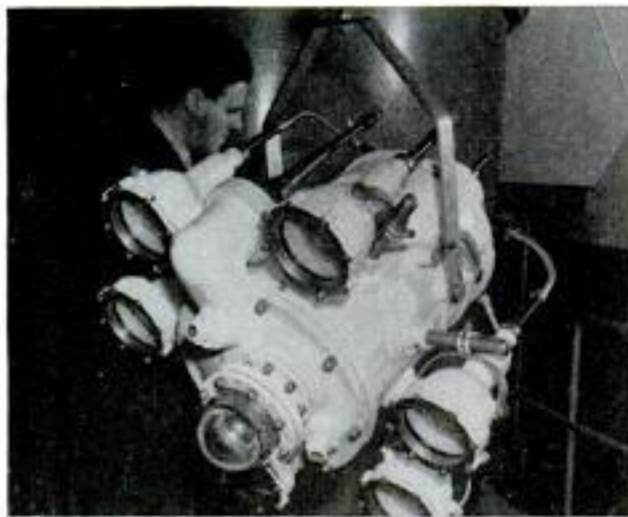
Double rafters brace building and support two-foot roof panels, which are secured with metal brackets

Still to be developed are improvements such as plumbing. Also under consideration are knockdown cabinets that can be used as interior partitions.

Mr. and Mrs. Colpron developed the basic idea for the first cabin when both became convinced there was a market for a structure that would combine the advantages of a hunting cabin and a tent. Mr. Colpron, a carpenter by trade, built the hut in the family garage during his spare time. As work progressed, ideas were added and the design changed. Now Colpron has opened a small shop where work proceeds on a second model. ★ ★ ★

Entire cabin is stacked on this small truck. Portability of the hut makes it ideal for hunters and anglers





Powerful lights encircle the domed camera lens. Photo at right shows TV view of diver taken with the camera

Underwater Television Camera Has Rotating Lens

Telecasts from the bottom of the sea are possible with a new underwater camera developed in England. The camera, designed for remote operation without the use of a diving cameraman, has a periscope lens which can be rotated in a full circle and elevated or depressed to any angle.

This permits the operator aboard ship to look in any direction. The lens is moved by motors in the camera. A hemispherical viewing dome made of a special glass protects the lens. Powerful lights surround the camera to illuminate a large area for underwater viewing.

Mobile "Sky Hook" Mounts on Truck

Next best thing to a sky hook is a personnel lift that gives its operator a 100-foot reach. A single hydraulic-control lever lets him soar to a height of 100 feet or achieve a horizontal reach of 58 feet. The Mobile Aerial Tower mounts on a large truck chassis and collapses to a height of 13½ feet for traveling.

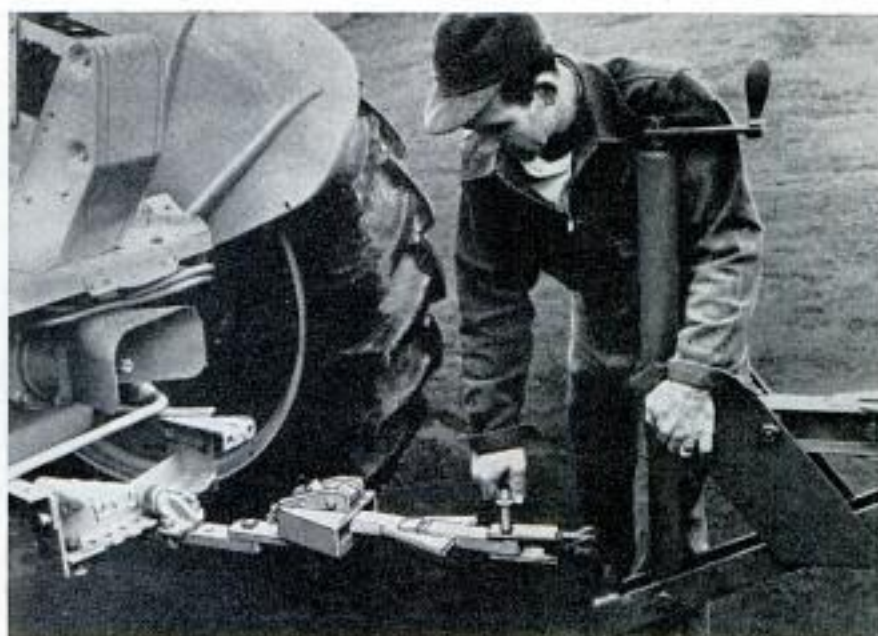
Midget Airport Scooter Positions Landing Ladder

Air travelers arriving in Rome descend on a landing ladder driven into place by a scooter. The driver of the midget buggy, perched beneath the upper end of the ladder, performs a moving operation that normally requires three or four men. Rome is one of the world's busiest airports, with 22 lines using its facilities.



Hitch "Reaches" For Implements to End Jockeying of Tractor

Tractors equipped with a new hitch need not be jockeyed precisely into position to pick up an implement. The drawbar hitch can be extended or swiveled from side to side. The farmer backs his tractor approximately into hitching position, then slides out the hitch to close the gap between the implement tongue and drawbar. He swings the hitch laterally into position and drops a retaining bolt into place. When he backs up the tractor an automatic lock completes the coupling.



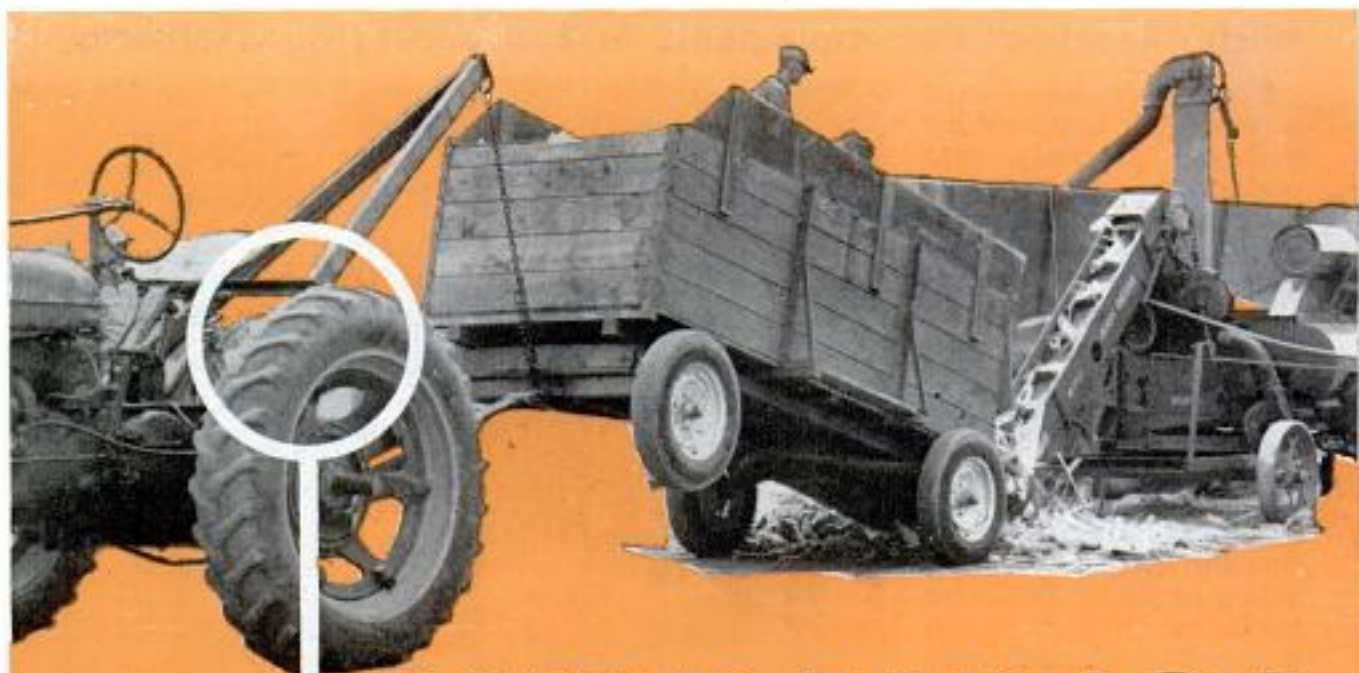
Double-Duty Hand Cart for Gardeners

With its huge canvas basket in place, a gardener's lightweight cart will haul five bushels of leaves or debris. Then, by removing the basket, the gardener can convert it into a hand cart for hauling trash cans and other heavy objects. The cart folds compactly for storage and, while it has only two rubber-tired wheels, it will stand upright either open or closed. A larger, 15-bushel-capacity model is also available.

Bricklike Pattern Given to Concrete

Concrete buildings are given a bricklike veneer with a mixture of crushed brick and concrete that is troweled on the wall over a soft concrete base. Jigs and forms suspended from a monorail track running along the top of the wall are pressed against the soft mixture to duplicate vertical and horizontal mortar joints. The process is said to give the advantages and the durability of brick veneer at lower cost.





HYDRAULICS

HARD-WORKING



FARMERS ALL OVER the country are putting to work a versatile handy-man they scarcely knew existed 15 or 20 years ago. This young farm worker is hydraulics. It popped up first in commercial farm machinery. Now farmers everywhere are using it in implements they design and build themselves.

Take Glen Cameron's mowing machine. Cameron, who lives near Selah, Wash., has built one of the most versatile mowers in existence and it is just about 100 percent hydraulically controlled. Hydraulics puts a great deal of power in the operator's hands.

"My mowing machine is steered completely by hydraulic power," Cameron explains. "The operator controls the course by working two small

Hydraulic unit at left raises boom to lift end of trailer as shown in top photo, dumping corn into elevator



FARM HAND

By F. Leland Elam

Cart equipped with hydraulic ram carries implements, controls bite into the soil

levers, making the task effortless. Hydraulic cylinders operate a clutch and brake system and the mowing bar is lifted by hydraulics. All controls are on a bar in front of the driver."

In addition, the mower has a four-wheel drive so arranged that the front and rear wheels can be turned by hydraulic power at the same time, either in the same direction or the opposite. This makes the machine exceptionally agile for getting into corners of fields, working along hillsides and along uneven fence lines.

The task of mowing has also brought one remarkable new use of hydraulics by a commercial farm-machinery firm in the powering of a mowing-machine sickle bar.

This mowing unit, except for the blades, is fastened on the underside of a tractor. It has two sets of sickle blades that are worked back and forth, face to face, by the hydraulic-power pressure that comes from the tractor engine. Control of the mower is through touch levers at the operator's seat. The mower can be lowered or raised to cut at any angle, making it possible to drive along a ditch bank and cut weeds on the inside or outside walls of the ditch, or to raise it at any angle up to the vertical

position for trimming the sides of hedges.

The inventors, Lloyd Steerman and William Hamel of Los Banos, Calif., point out that "because of the swift rate of speed at which the knives are worked by smooth hydraulic power they will cut through any heavy tangle of plants or mole hills of mud without becoming clogged. The new machine can be operated at a greater speed than conventional mowers, making it possible to cut mowing time by 25 percent."

Using hydraulic power you can multiply the power of an arm or motor. It will team up with automatic devices to push, pull or lift loads of almost any size.

"I like to flip a little lever and let a pump do the job I would have to do by hand if it were not for hydraulics," Robert Simons of Rio Vista, Calif., says.

This rancher uses a set of two 15-foot spray booms on the front of his tractor to spray for weed and insect control on row crops. His farming enterprises are scattered through the Sacramento River islands making necessary transporting of the sprayer along public and farm roads. To do this, the spray booms must be lifted to near vertical positions. Two hydraulic rams, one on each side of the tractor



Operator of ranch-designed mowing machine controls all four wheels, brake, clutch and cutter bar by hydraulics



Another home-built machine is a hydraulic fork lift that will raise 1000 pounds to height of nine feet. Here it is used to move beehives to alfalfa field. Below, home-designed ditcher has two hydraulic controls to raise, lower and tip the blade



engine, easily accomplish the task.

Herbert Rouch of Kingsburg, Calif., felt that there was too much tiring arm power necessary in the manual operation of a scraper used for leveling orchard ditches, so he rebuilt his scraper using hydraulics to lift and lower the blade and to dump its contents. Being able to exert downward pressure, he could also control the bite exactly as desired.

Another of his hydraulic farm machines is a two-wheeled rig pulled behind the tractor on which are mounted such implements as plows, cultivators, harrows and disks.

"The hydraulic ram makes it possible," he explains, "for me to control with ease the depth I wish the tools to bite, and to lift the tools high enough off the ground that the unit can travel to work without cutting into roadways."

Hydraulic power is flexible. It can be sent around curves and corners and applied in any direction from its source. It can be teamed up with electronic controls to do some jobs automatically. When pressure is exerted on a liquid in a closed container, such as a cylinder, the pressure is transmitted undiminished in all directions. It



Commercial hydraulic mower operates at high speed and can be raised to any angle for ditch or hedge trimming

also acts with equal force on all equal surfaces. Multiplication of the surface gives multiplied force.

The hydraulic systems now found on farm tractors may use either pistons or gear pumps to provide pressure. Pistons are generally used for high pressures of 1500 to 3000 pounds per square inch and gear type for pressures of 500 to 1200 pounds.

There are either single or double-acting cylinders. The only duty of the single-action type is to exert pressure for lift, with gravity or suction furnishing the downward movement. The double-action is more versatile as it can push or pull.

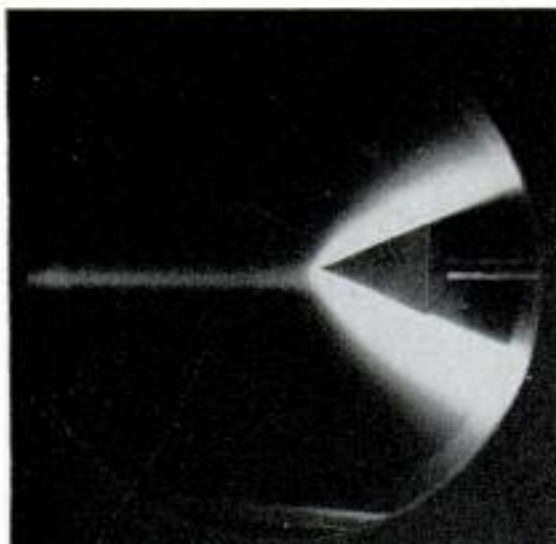
All that is necessary to send hydraulic power from the power-developing unit to a remote job is a strong tube through which the liquid will flow under pressure and activate the cylinder or hydraulic ram.

F. L. Titus, a farmer near Pullman, Wash., says "I wouldn't trade my tractor with its front hydraulic lift for any other piece of farm equipment. I can do more with it in a day than I could do without it in a week and it makes many a back-breaking task easy.

(Continued to page 218)

Front hydraulic lift, one of the most versatile tools on the farm, can be used as high platform, pile driver and scraper





Cornell Aeronautical Laboratory photos

Through the porthole, a model rocket is seen outlined against air heated to incandescence. Right, exhausted air flowing from escape ports, to the right of circular test area, lights up on impact with still room air

Wind Tunnel Tests Rocket Models at 10,000 Miles Per Hour

Exploding gases whoosh air through a new wind tunnel that tests rocket and missile models under stratospheric conditions at speeds 13 times greater than sound. This is expected to increase to about 15,000 miles per hour in future trials. In the cannonlike tunnel, developed in the Cornell Aeronautical Laboratory at Buffalo, the gases—a mixture of helium, oxygen and hydrogen—create an air flow that bursts into flamelike luminosity when it encounters resistance.

The temperature created by the friction and shock waves is approximately 7000 degrees Fahrenheit, high enough to melt all known metals. Tests are completed within $\frac{1}{1000}$ of a second to prevent the complete apparatus from disintegrating into molten, vaporized metal. The temperature of the stratosphere, minus 68 degrees Fahrenheit, is created in the tunnel by expanding the air flow as it enters the test throat. Photos record effects of air against the models.

Helicopter With Five-Pound Ramjet Engines to Fly 80 Miles Per Hour

Weighing only 100 pounds but lifting more than four times its weight, a new ramjet helicopter is expected to fly at speeds of up to 80 miles per hour. Built by Benson Aircraft of Raleigh, N. C., for military uses, it is designed for beachhead as-

saults, dropping men behind enemy lines and for the evacuation of pilots and others from inaccessible places. The aluminum ramjet engines, located on the tips of the rotor blades, weigh five pounds each and use ordinary gasoline or fuel oil.

With a rotor span of only 15 feet, the midget helicopter fits into an average garage with room to spare

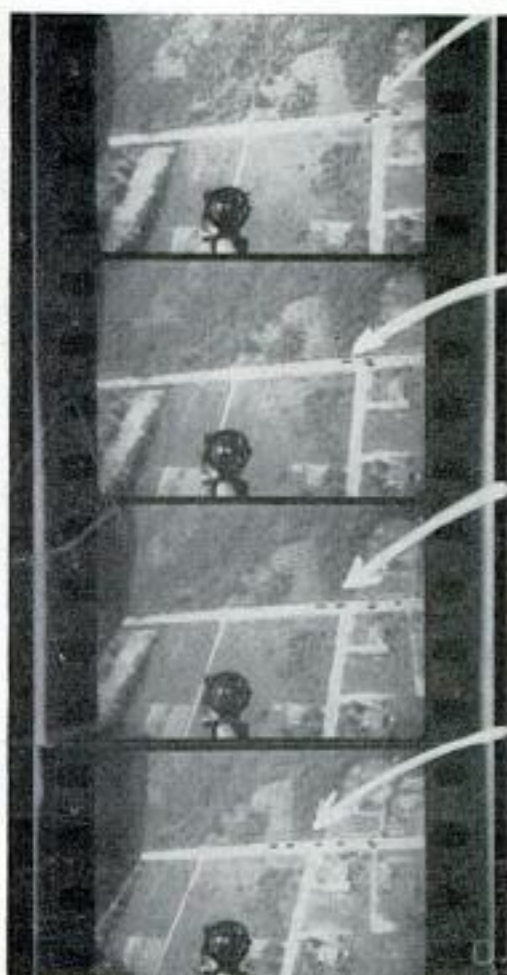
Benson Aircraft Corp. photo





Aerial Photographs Map Traffic

One thousand feet above a swerving, passing line of automobiles a Virginia State Police plane purred. Beside the pilot sat a photographer recording the scene with a movie camera adapted to take sequence stills of the traffic pattern—88 pictures per minute. The strange expedition was part of a traffic study directed by George Washington University Professor Bruce Greenshields for the National Science Foundation. Greenshields believes that "highways should be built in accordance with what drivers actually do, and not with what engineers think they should do." Accordingly, thousands of aerial pictures were made of traffic patterns and used to discover information helpful in building future highways.



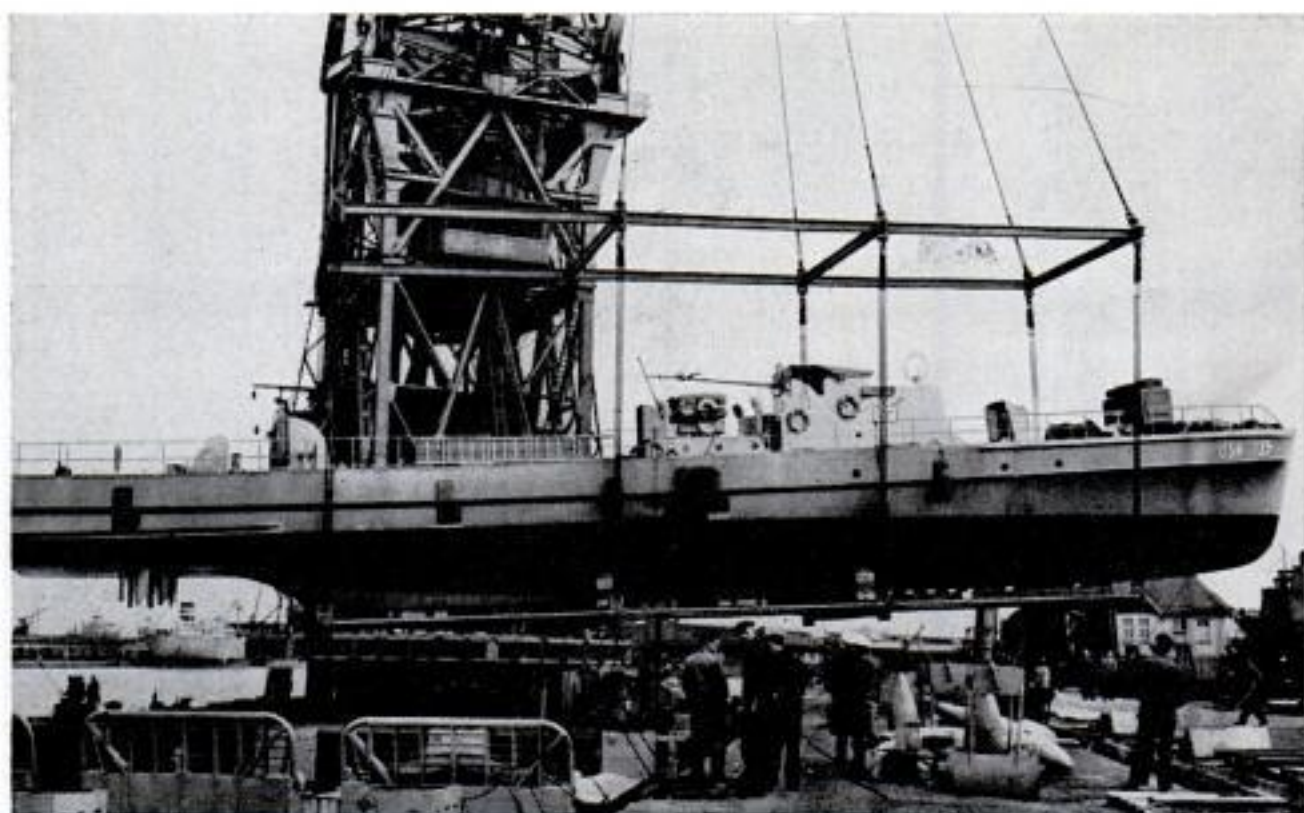
Plane crew, upper left, gets last-minute instructions from Dr. Greenshields before taking off. Film strip, above, was taken at rate of 88 frames per minute. Six-mile stretch of highway was used for the survey

Test "T" Tail for Improving Performance of Flying Boats

Less weight and better flying characteristics for future Glenn L. Martin flying boats are expected to result from a "T" tail now being test flown. The new tail, in which the control surfaces are mounted

atop the vertical fin, is smaller and creates less aerodynamic drag, permitting large fuel savings on long-range patrols. The tail's efficiency is also increased by its higher position relative to the wing downwash.





Floating Crane Picks Up Mine Sweeper and Deposits It in Sea

An entire ship—a United States Navy mine sweeper—is lifted with ease by a 250-ton floating crane at the embarkation port of Bremerhaven, Germany. The crane is

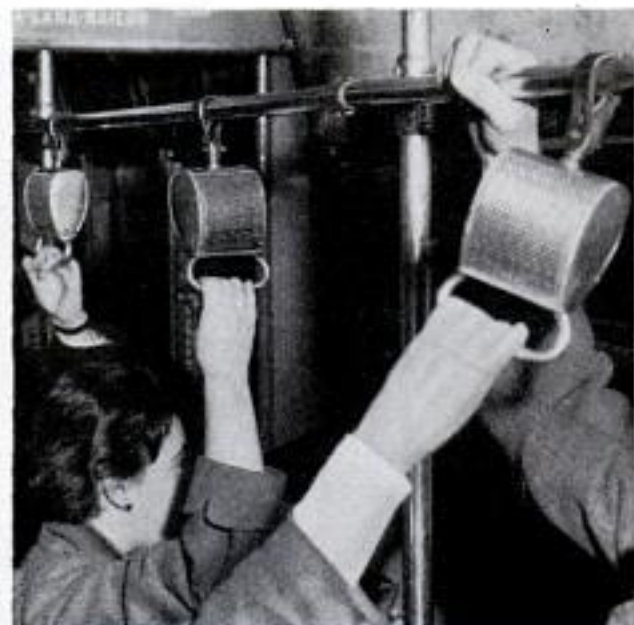
one of the largest in the world and the pick-up was one of the largest ever handled at the port. The crane was used to lift the ship back into the water after a repair job.

Musical Streetcar Straps Serenade and Advertise

“Canned” music and commercials greet standees on streetcars in Milan, Italy, when they grab a strap. Phonographs under the seats lead to an amplifier on each strap. Pressure on the strap starts the music and advertising spiels, and there’s nothing the captive audience can do about it.

Bulletproof Apron and Mask Protect New York City Police

New York City police are better equipped than ever to apprehend and engage in gun battles with dangerous armed criminals. Bulletproof garb now on hand includes a face-saving mask and an apron which protects the body trunk more completely than did the older armored vests.



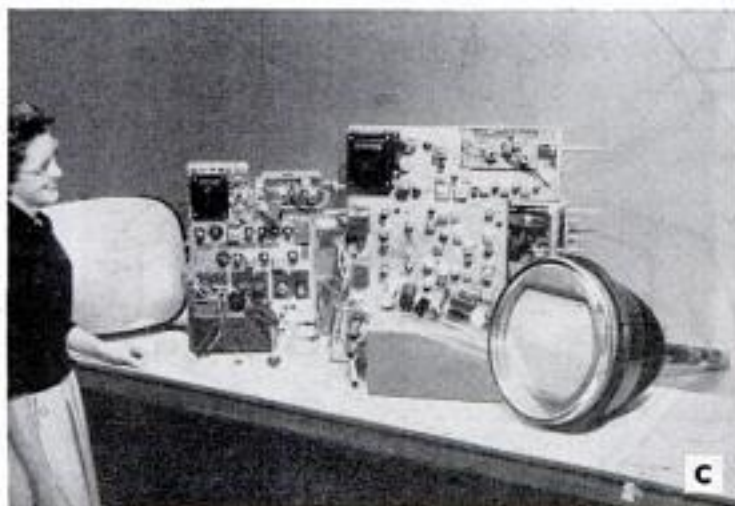
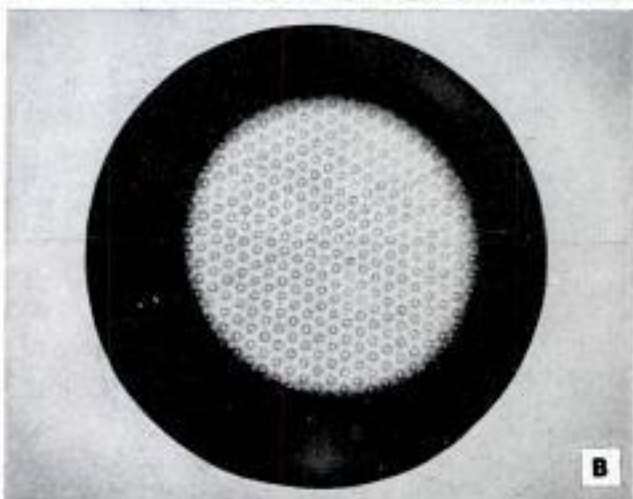
Radio Television Electronics

TELEVISION TODAY

COLOR TV moves ahead with rapid developments in tricolor tubes. The 19-in. tricolor tube in photo A was recently shown at the David Sarnoff Research Center of RCA at Princeton, N. J. It is being compared with a 15-in. tricolor tube by Dr. D. Joseph Donahue, one of the development engineers. The new tube, with nearly double the picture area of the 15-in. tube, is expected to be commercially available in limited quantity toward the end of this year; the 15-in. tube is already in production. A color-dot pattern of an RCA tricolor picture tube appears in photo B as seen through a magnifying lens. The approximately 600,000 dots of phosphor material on the tube's screen are arranged in triangular groups—each group containing a red, a green and a blue phosphor dot.

An interesting comparison between the amount of equipment required for today's large-tube black-and-white and the compatible 15-in. tricolor tube receiver is shown in photo C. General Electric's 21-in. picture tube and the 24-tube chassis, at left, are dwarfed by the typical 15-in. tricolor picture tube and its 41-tube chassis, at right, that is required to drive it. The cost of color sets will be about three times that of today's black-and-white TV receivers.

TV installations are now standard built-in equipment in mobile homes (trailers). The CBS-Columbia 17-in.-screen, harmonizing installation, illustrated in photo D, is in a coach manufactured by the Pacemaker Trailer Company. All-channel tuning serves the extensive traveler.



ANY BROADCAST RECEIVER

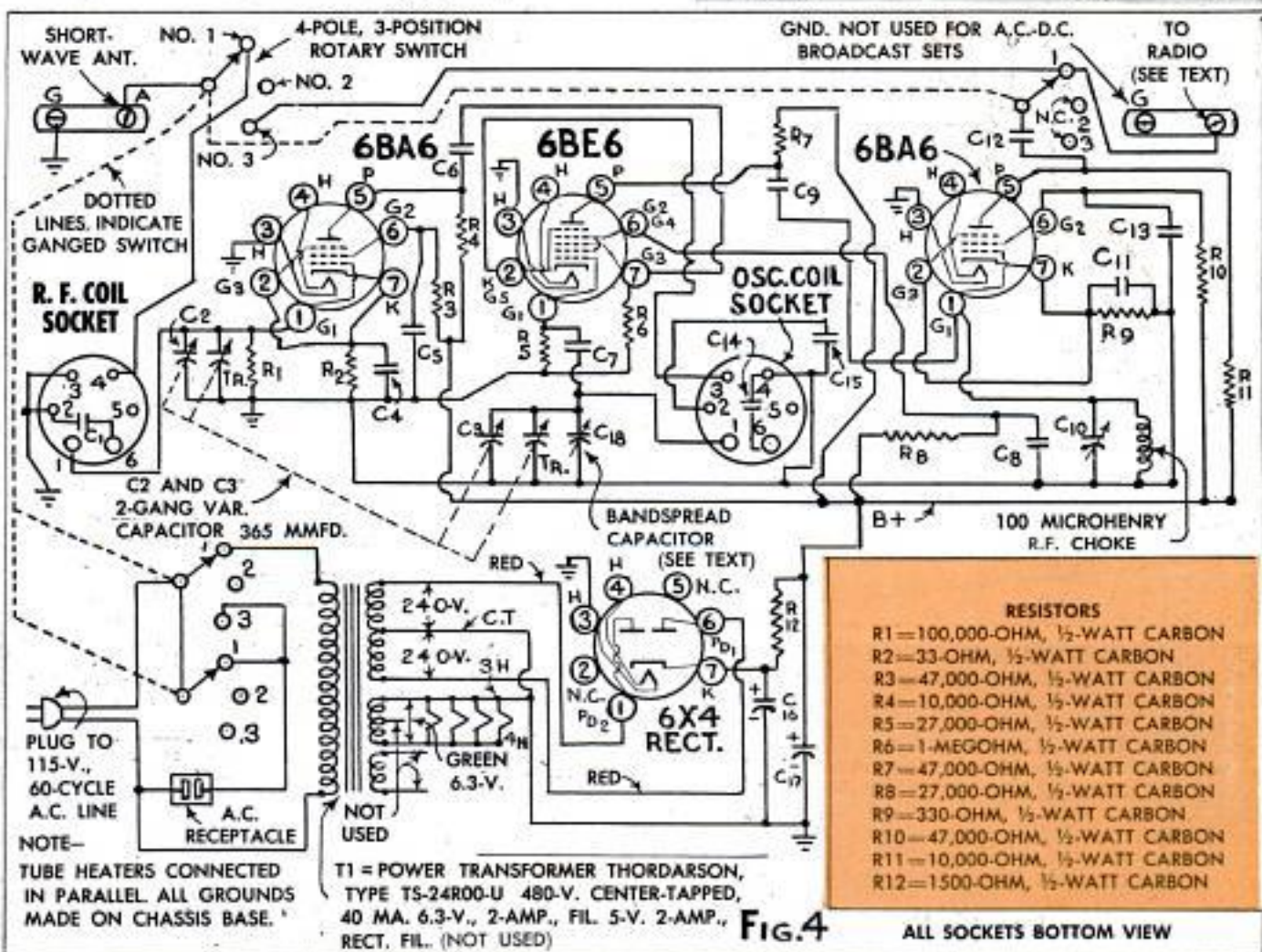
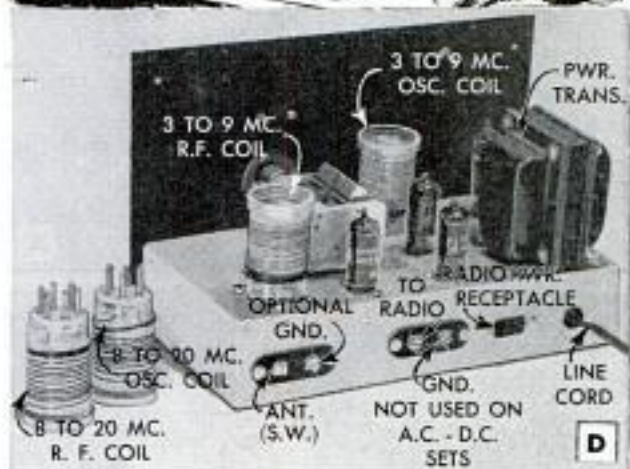
By Lothar Stern

loop for the connection of an additional antenna wire.

If the radio employs a ferrite loopstick antenna, or a loop antenna without provision for an outside antenna, the converter output is merely connected to the "hot" end of the loop which, in turn, usually connects to the signal grid of the radio's "converter" stage. Naturally, the better the receiver and antenna used with the converter, the greater will be the gain and selectivity of the system.

Schematic circuit diagram Fig. 4 shows the complete converter circuit. Two sets of hand-wound plug-in coils, detailed in Fig. 3, and the coil-winding chart F, are used to cover the frequency range from 3 to 20 megacycles. This includes the major short-wave foreign and domestic bands as well as the 80, 40 and 20-meter amateur bands. The coil forms are Amphenol low-loss polystyrene type 24-6P plug-in variety, having 6 prongs. These are 1 1/4 in. x 2 1/4-in. standard type available from radio-parts

(Continued to page 214)



RADIO and ELECTRONICS TODAY



COLOR-TELEVISION picture-tube screens have three different phosphor materials in a mosaic dot pattern on a glass plate, a phosphor for each of three primary colors—red, blue and green. Photo A shows an engineer at the Sylvania Research Laboratories using a photographic method of forming the complex screen. Light from the point source passes through an aperture plate containing more than 200,000 precisely spaced small holes. Rays of light fall on the desired dot pattern on a photographic emulsion containing the color phosphor. After controlled exposure and processing, only the color phosphor remains in the pattern. The process is repeated for the other two phosphors with the screen and aperture plate moved slightly to permit the new dots to fall between those previously formed. The full color picture is produced by each of three electron streams being made to fall on the appropriate set of color-phosphor dots.

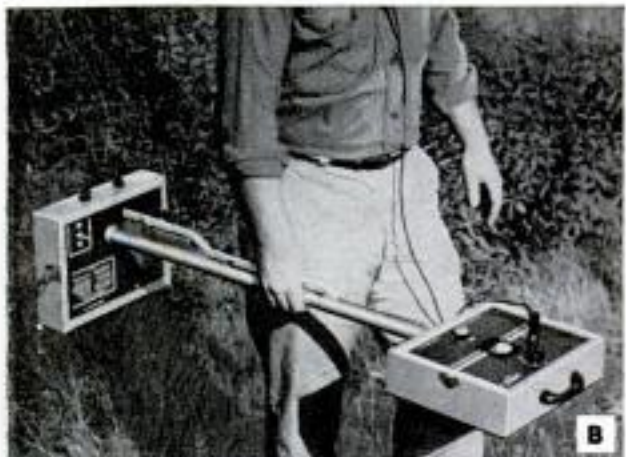
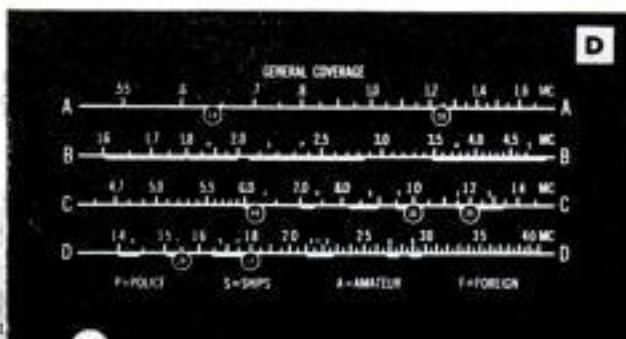


Photo B shows a portable 10-pound electronic detector for locating buried metals. It was designed for public-utility companies and engineers, as well as the treasure hunter and prospector. It employs low-voltage batteries and consists of a transmitter and receiver.



One of the outstanding low-cost communications-type receivers recently introduced to fill the needs of varied classes, from the amateur and short-wave listener to the many commercial service and Civil Defense groups is illustrated in photos C and D. Eight miniature-type tubes plus rectifier are employed in the NC-88 in a modern superheterodyne circuit with a continuous frequency coverage of 540 kilocycles to 40 megacycles. Both voice and code telegraphy are provided to permit worldwide coverage over the entire range. Dials include the location of the new Civil Defense frequencies. A new dial, photo D, of especial interest to short-wave listeners, is now available. This dial is calibrated for the general short-wave bands on the band-spread portion instead of the ham bands.



the

POPULAR
MECHANICS

CRAFTSMAN

TILE-TOP TABLES

By C. E. Packer

GAY-COLORED TILE and hand-wrought iron may be combined to make decorative tables of distinctive individuality. In small tables especially, the designs possible with colored tile offer the craftsman a choice to suit almost any taste in patio furnishings. The easy workability of flat steel permits construction of attractive tables with only a few common tools.

All iron (mild steel) parts can be assembled either by riveting or welding. Colored tiles come in standard sizes, and special shapes also are available. When assembling





The beautiful table at the left features colorful scenic tile set in a graceful wrought-iron base. The base members are welded together



Four yellow-and-black tiles are used for the top of the hexagonal table pictured above. Small scrolls are bent at the ends of otherwise straight legs to form feet, providing a simple base for the tile top



Interesting over-all pattern of the table top at left is formed by four separate tiles. The base consists of four spirally twisted legs joined together with a pair of rings to achieve pedestal effect

individual tiles into a desired pattern, allow at least $\frac{1}{8}$ in. between adjacent tiles to provide clearance for the cement. Where the tiles are to be set within an iron framework, such as a table top, allow the same clearance all around the top.

Although much more elaborate forms are sometimes used, tile table tops usually are square, rectangular or hexagonal. The square and rectangular tops are, of course, the easiest to construct. Nearly all outer members of the top frameworks can be made from one length of steel angle by notching one web, as shown in the detail, to permit bending. After the angle is bent, clamp the frame to a table top and take careful measurements. Any irregularities usually can be corrected by filing the meeting edges of the notches. Make sure also that the meeting edges join without forming an offset, as this may cause some difficulty when setting the tile. This can be corrected by hammering on a hard surface.

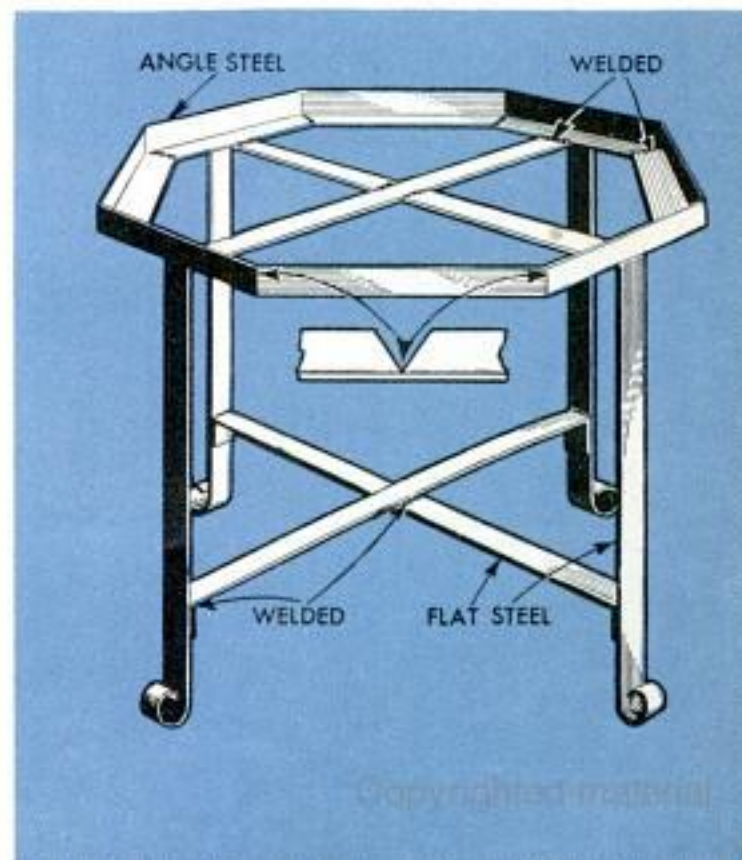
Note in the detail that the top framework has additional members to support the tiles at the joints. These supports are essential in the open, or spider, type of top framework. Care must be taken to see that they are centered directly under the tile joints. These members are shown lap-joined and welded at the center and ends. This manner of assembly affords exceptional strength and rigidity, but requires an additional thickness of cement to support the tiles level. Some craftsmen butt-join these supporting members, resulting in a flush surface and a uniform thickness of cement under the tile joints. This is an advantage in setting the tile but strength is sacrificed and the joints must be welded.

Leg and stretcher assemblies of the tables pictured require only simple bends and short spirals. Remember that in bending spirals the stock will be shortened somewhat, depending on the length of the spiral. One method of making the spiral is to clamp the flat iron horizontally in the vise, the jaws closing at the point where the spiral is to start. Then tighten the jaws of an adjustable wrench on the work, the distance between the wrench and the ends of the vise jaws being a little greater than the required length of spiral. Simply twist the work with the wrench until the desired spiral is attained. Bending circular forms and scrolls usually is done over a form to assure a uniform bend. Flat steel up to 1 in. wide and $\frac{3}{16}$ in. thick can be bent cold with ordinary tools.

When setting the tile in the table frames, apply the cement to the surfaces of the supporting members. Then place the tile in position and fill the spaces between with cement. Be sure to wipe off all excess cement before it dries. ★ ★ ★



Illustration above shows tile being checked for proper clearance in steel-angle table frame. Hexagonal frame and base were made as in the detail below

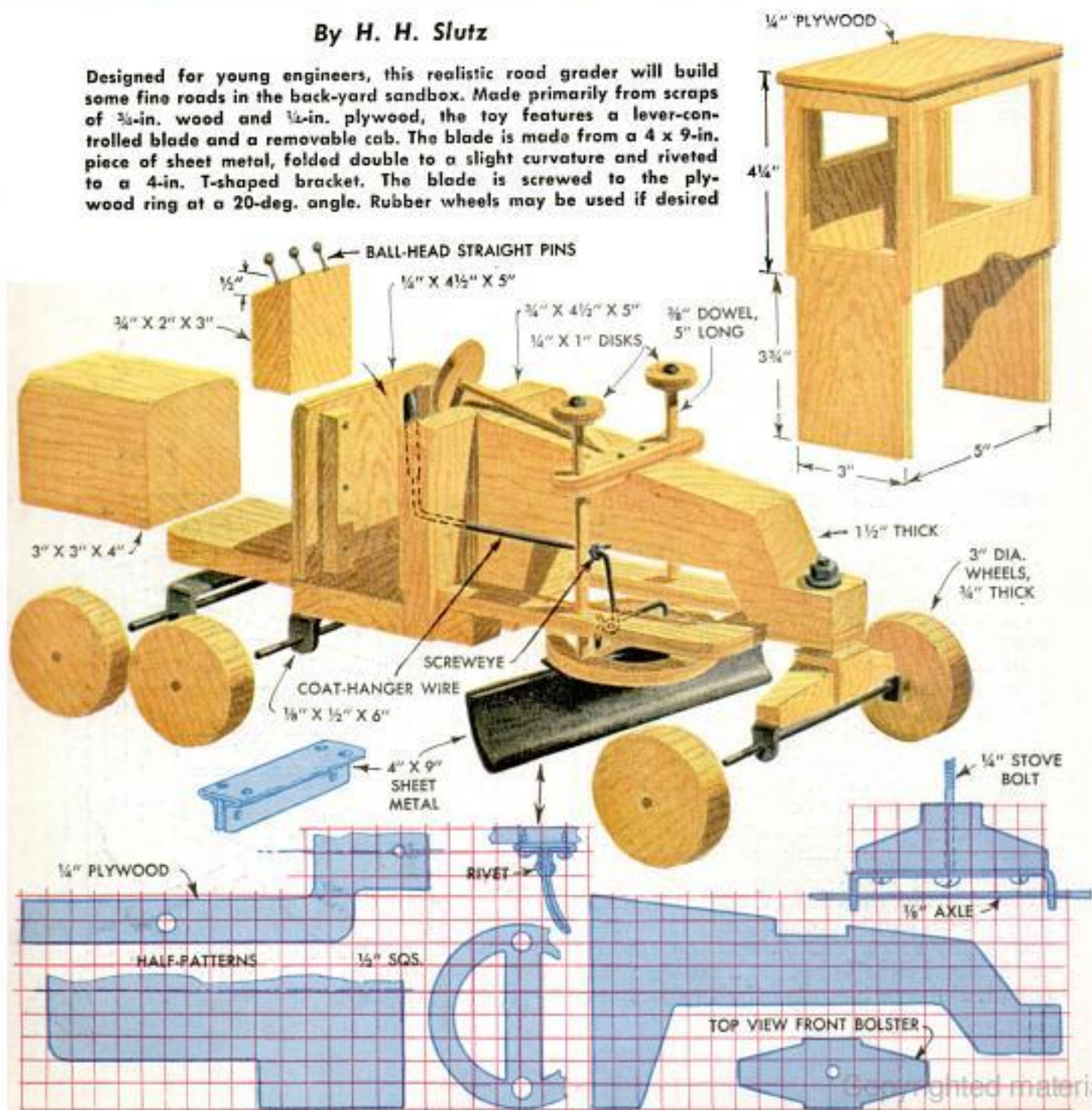


TOY ROAD GRADER



By H. H. Slutz

Designed for young engineers, this realistic road grader will build some fine roads in the back-yard sandbox. Made primarily from scraps of $\frac{3}{8}$ -in. wood and $\frac{1}{4}$ -in. plywood, the toy features a lever-controlled blade and a removable cab. The blade is made from a 4 x 9-in. piece of sheet metal, folded double to a slight curvature and riveted to a 4-in. T-shaped bracket. The blade is screwed to the plywood ring at a 20-deg. angle. Rubber wheels may be used if desired



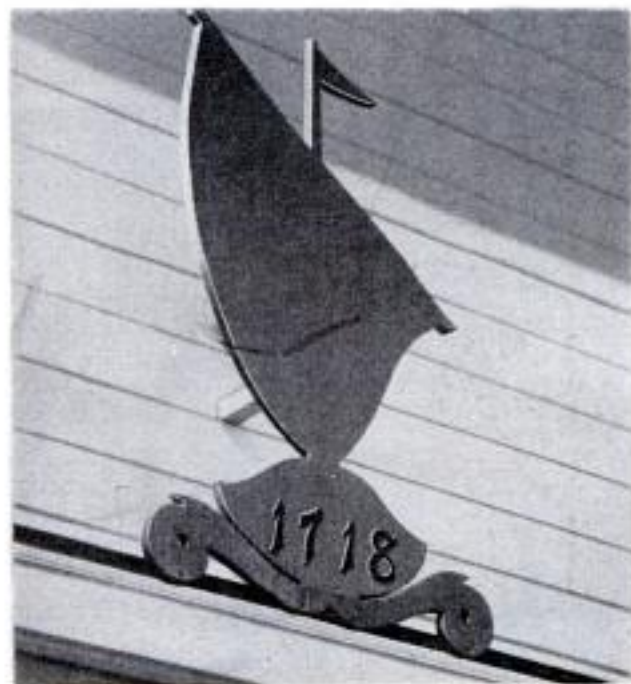
Individualized House Numbers

By Roberta L. Fairall

THE NUMBERS on the front of your house don't have to be prosaic and unimaginative. Instead they can not only identify your address but also be distinctive and decorative. There is no limit to the designs that are possible and you can give your imagination free rein. A dog fancier might use his favorite breed as a motif, a musician could adapt a design incorporating the scale or musical notes, etc. Such designs can be clever, cute or serious in treatment. And no matter what the shape, friends will learn to recognize your home as much by this "insignia" as by the number itself.

A number of suggested designs are shown and can be used as they are or with some modifications. Or, if you intend to work out an original design, you can follow the methods of construction that are illustrated. Squared patterns for two types of numbers are given. These are easily transferred in the correct proportions to a plywood sheet for cutting on a jigsaw. In making any of these numbers, always use exterior-type plywood and fasten the various parts together with both nails and waterproof glue. Give the finished project two base coats of white outside paint, and then use colored paint for decoration. To

Below is a free adaptation of a sailboat used as the background for an unusual house-number design



JUNE 1954



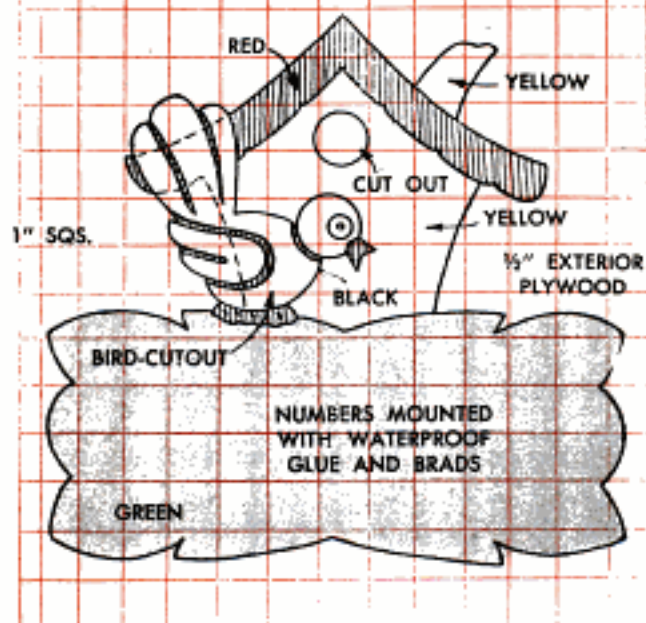
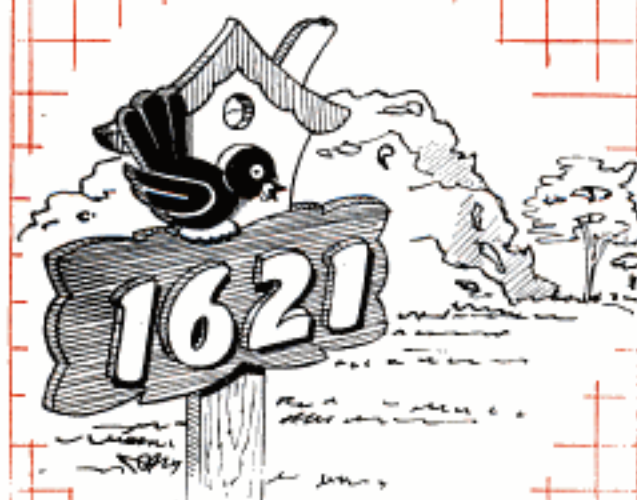
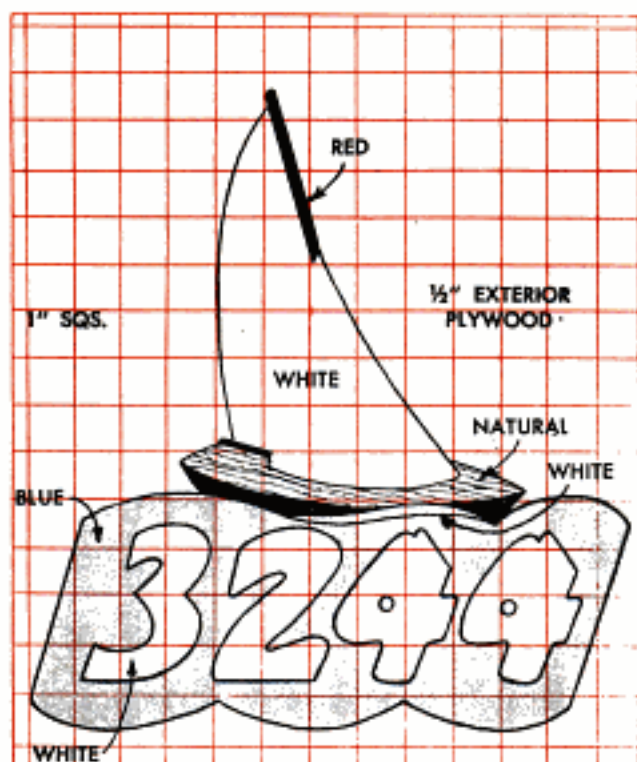
afford more complete protection against the weather, it is a good idea to give each item a final coat of clear spar varnish.

Interesting effects can be achieved by handling the numbers that go on the plaques in various ways. For example, when cut from heavy plywood and held away from the background by rubber washers, the numbers will cast deep shadows. Or, they can be silhouetted against a background. If you do not wish to cut out the numbers, most hardware stores have a selection of metal and plastic numbers in various sizes that you can buy. These can be attached to any background.

Cartoon figures, such as the one below, used for a humorous effect are popular for numbering plaques

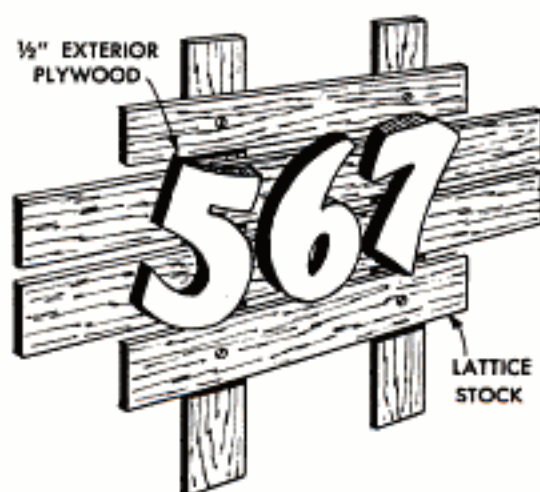


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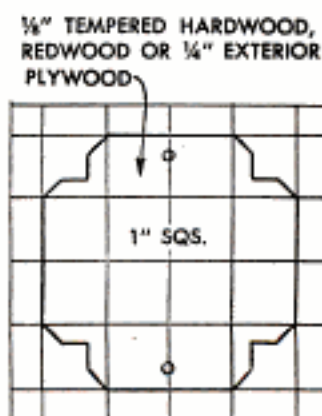


House-number plaques can be attached to a gate or fence, to the house or porch, to a post in the yard, or they can be set in the lawn. Use roundheaded brass screws for mounting in each case. If the plaque is to be set in the lawn, screw a stake to the back of it. The stake should be made of redwood since it resists decay, although any other type of wood is usable if first treated with a wood preservative.

As a final touch, the numbering plaque can be illuminated. In some cases it will be possible to install small lights right in the plaque, usually so that the numbers are highlighted. When this isn't possible, a small spotlight may be concealed near by and pointed at the plaque. If you wish to avoid the job of outside wiring, luminous paint or reflective tape can be used to make the numbers visible at night. ★ ★ ★



FLAT-HEADED SCREW
 1/2" RUBBER WASHER
 ROUNDHEADED BRASS SCREW
 WASHERS HOLD NUMBER AWAY FROM BACKING TO CAST SHADOW

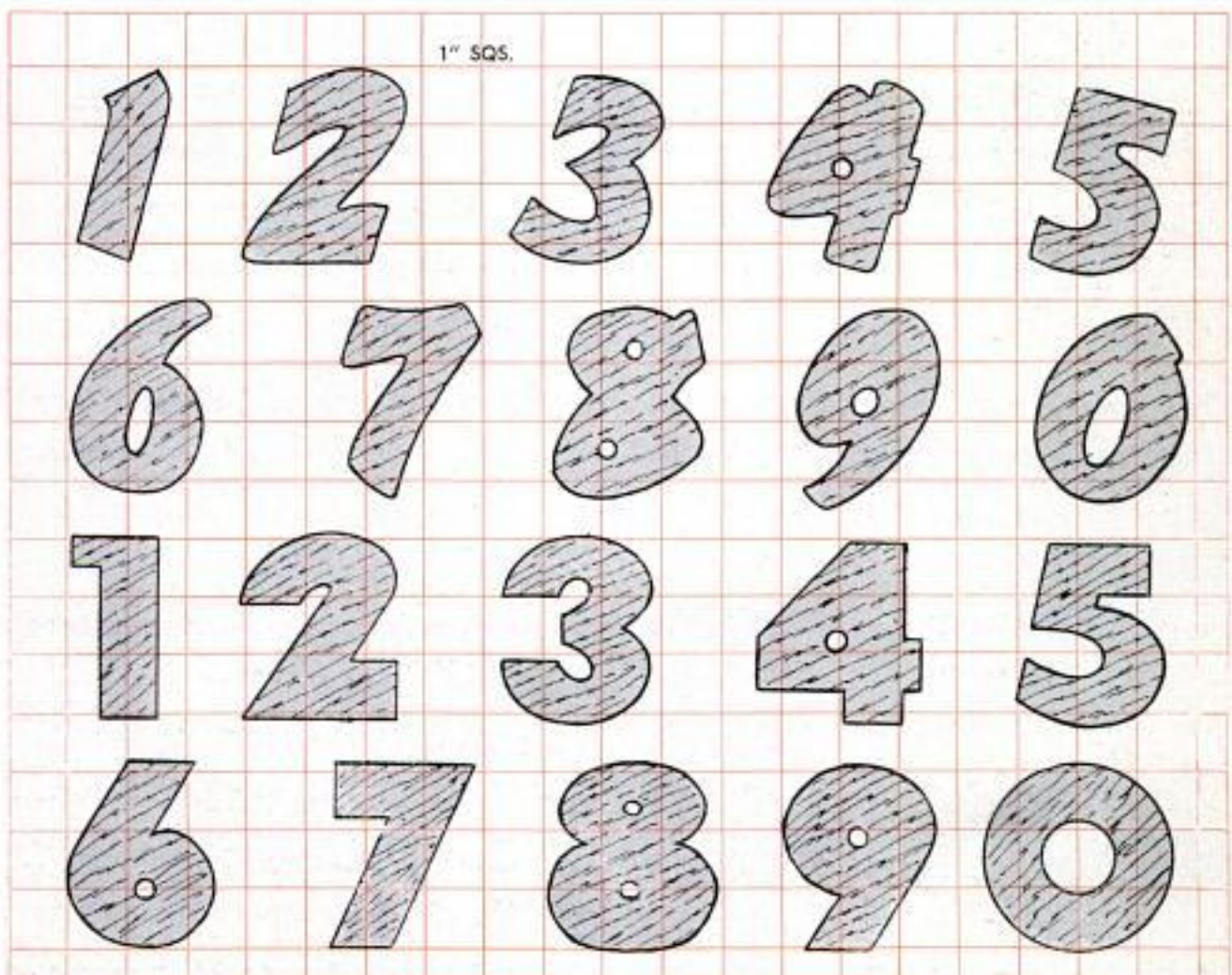
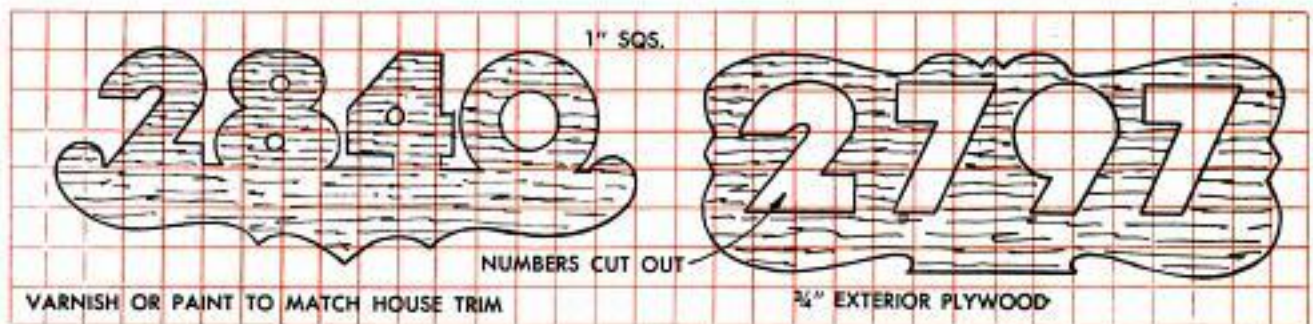




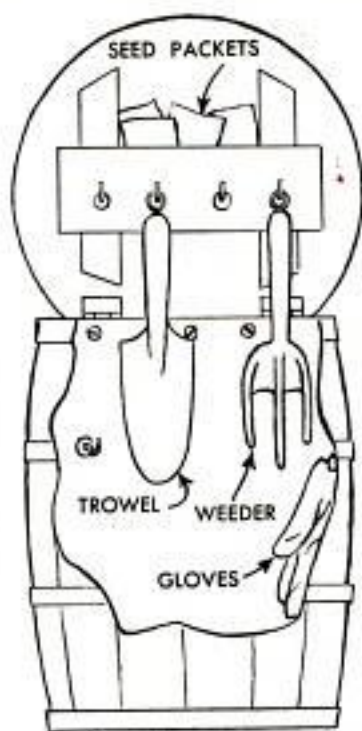
Above is an unusual house-number plaque, made by nailing stylized numerals on a piece of simulated driftwood



The numerals in the photo above were purchased from stock at a hardware store and mounted on plaque



Nail Keg Made to Serve as Storage "Kit" for Small Garden Tools

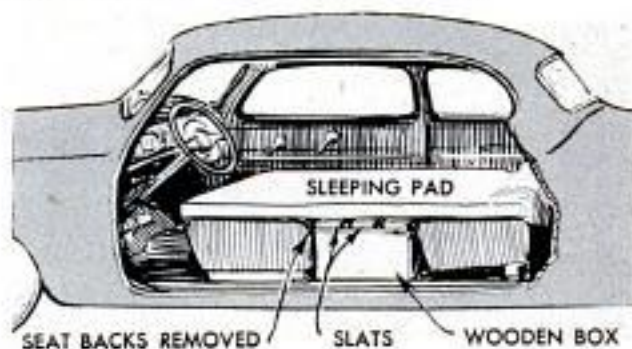


Small garden tools are less likely to be mislaid if they are kept in this portable kit. It is nothing more than a small nail keg fitted with a hinged lid of plywood and a carrying handle. To attach the lid, a wooden block is bandsawed to the contour of the keg and screwed flush with the top to take the hinges. A hook and screw eye keep the lid closed when the kit is being carried. The carrying handle is attached to the center of the top side of the lid. A wooden bracket and cup hooks will provide a means of holding the tools.

Hi Sibley, Nuevo, Calif.

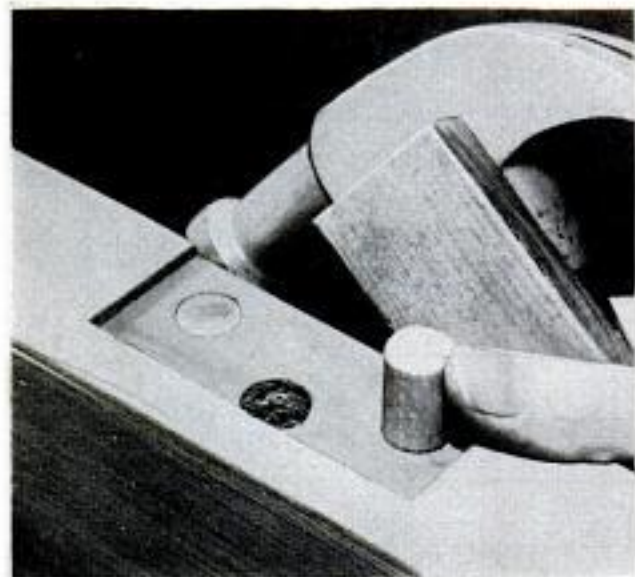
Bed Improvised Across Car Seats Helps to Cut Vacation Costs

One car owner has adapted his two-door sedan to sleep two by using two wooden crates and three lengths of 1 x 4 lumber. The requirements will vary with different makes of cars, but the main idea is to remove the back sections of the front seat. Pull the cotter keys out of the middle and two end pins on which the backs swivel. The middle pin is readily pulled out with pliers, but the two end pins are more difficult and each seat section must be pulled sideways to remove them. With the backs stored in the trunk, the two crates, which are a little lower than the seats, are placed on the floor of the car and the 1 x 4s are



placed on top of the crates, crosswise of the car. A heavy comforter is used as padding.
Dean C. Malmo, Gonvick, Minn.

Oversize Screw Holes in Door Repaired With Lengths of Dowel



The next time you have difficulty replacing a wood screw—as is often the case with hinges on wooden doors—because progressively longer and larger screws have destroyed too much of the wood, use a length of dowel as a repair. Drill out the screw hole to a generous oversize, wipe the inside surface with glue and tap in a short length of dowel. Cut a shallow groove on one side of the dowel to allow air and excess glue to escape as the dowel is driven in. When the glue is thoroughly dry, cut off the dowel flush with the surface, drill a pilot hole and use the original-size wood screw.

R. F. Donovan, Guttenberg, N. J.

☛ A discarded fingernail clipper makes an ideal tool for removing wire staples from walls and bulletin boards.

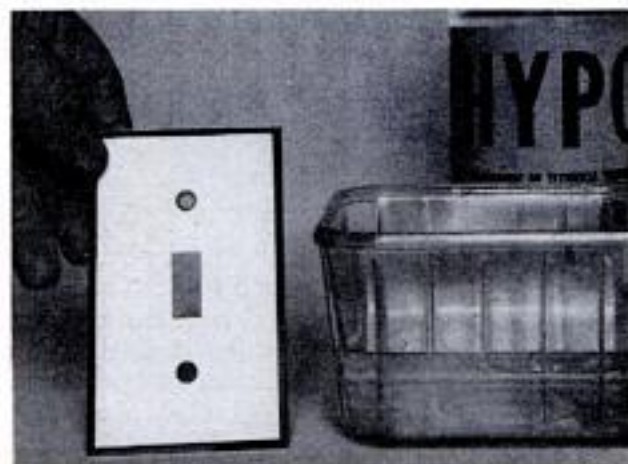
Folding Bed Converted to Attractive Patio Lounge Chair

Instead of junking an old folding bed that was no longer being used, one craftsman converted it into an attractive patio lounge chair by merely fastening wooden slats over the springs. The link-spring construction of this type folding bed is a network of wire suspended from the frame by coil springs spaced around the edge. The $\frac{1}{2}$ x 3-in. slats were cut just long enough to stay inside the coil springs. Holes were drilled near the ends of the slats and $\frac{1}{4}$ -in. machine screws were used to hold the slats to the wire. The holes were spaced so they came inside the V-shaped wire into which the coil springs hooked. A larger washer



straddles the wire vee and holds each slat securely. Both the slats and the steel bed-frame then were painted as protection against the weather.

Small Brass Objects Silver Plated With Exhausted Hypo Solution



Small brass objects, such as electric switch covers, may be silver plated by immersing them in exhausted photo hypo that is about to be discarded. First, clean all tarnish and lacquer from the brass by using steel wool and scouring powder. The object to be plated is then submerged in the hypo solution for about one minute. Then it is rinsed in clear water and dried with a soft cloth. A coat of clear lacquer will increase the durability of the silver plate. Only a hypo solution which has been exhausted should be used, as a fresh solution contains no silver.

O. A. Nelson, Seattle, Wash.

Proper Insertion of Photoflash Bulbs Assures More Light

About 10 percent more light can be utilized from a photo flash bulb, if the bulb is placed in the holder so that the filament wires are in line with the scene to be lighted. The reason for this is that a black "soot" is deposited on the inside of the glass when the paste on the filament is ignited. The soot develops before the main flash occurs, thus reducing the total output of light. Examination of a used bulb will show that the black spots are always at right angles to the line of the filament wires. Thus, by properly placing the bulb in the flash gun, the darkening effect of the soot spots can be eliminated.

☐ If you've lost the original rubber washer or gasket from your gallon vacuum jug, a fruit-jar ring may be substituted.



X662

WTM 56

For a center of interest in the garden or terrace, or as a decorative fill-in for a blank spot on the house wall, design and build a

Sundial



By W. S. Kals



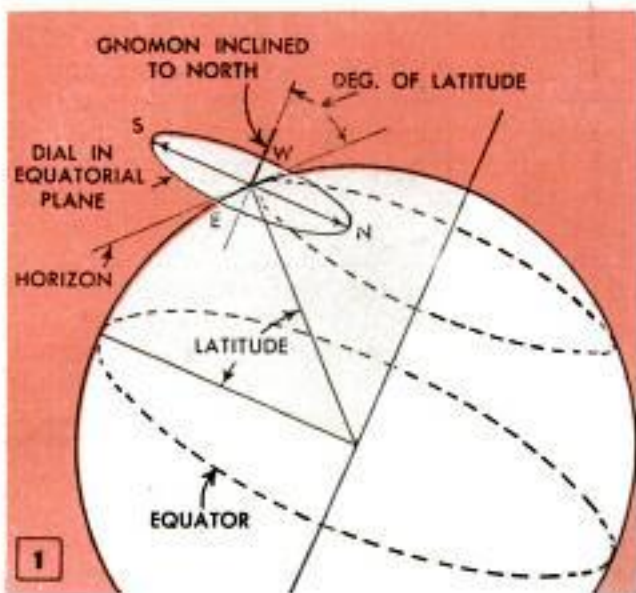
BRINGING SOMETHING out of the past and displaying it in a modern setting always appeals to the homeowner who wants his home to be distinctive. The sundial, with its historical significance and unusual decorative qualities, is ideal for this purpose.

Actual construction of a sundial is not complicated and permits the use of almost any material that will withstand exposure to the elements. The dial may be cut from lead, copper or linoleum and mounted on a wooden, steel or concrete pedestal, or installed vertically on a wall. If you like, the vertical dial might be painted directly on the wall, or a horizontal dial may be impressed in fresh concrete, laid out in mosaic or even planted in flowers. Thus, you have an almost unlimited range of materials, designs and sizes.

The most important factor in making a sundial that really works is laying out the dial itself. This will vary according to the particular latitude of your home and its longitude in relation to the standard-time meridian. You'll probably want to incorporate the necessary correction in the dial to make its reading agree as nearly as possible with local time.

Before beginning actual selection and layout of a sundial, it is best to understand the principles on which a sundial functions. These are best explained by the equatorial

dial; so named because the dial plate is in the same plane as the earth's equator. This is the simplest type of dial and the one on which all other dials are based. The gnomon, a thin rod that casts a shadow on the plate of the equatorial dial, works in the same way as a flagstaff at the north pole; that is, as the earth revolves, the summer sun would cast the shadow of the flagstaff through a rull circle each 24-hr.



POPULAR MECHANICS

period. As the circle is 360 deg., each 15-deg. segment of the circle is equivalent to 1 hour. The equatorial dial is easily made, as shown in the details of Fig. 3, and will give you an accurate reading. Its one objection, however, is that it will only tell time from March to September in the Northern Hemisphere. The horizontal and declining vertical dials are a little more complicated, but they will tell time the year 'round.

There are two corrections necessary to permit your sundial to indicate time accurately. One is the daily correction to allow for the variation in length of the actual day with that of the 24-hr. day used by civil time. This variation reaches a maximum of 16 min. as indicated by the table, upper right. If you desire, a scale for making this correction can be incorporated in the equatorial dial.

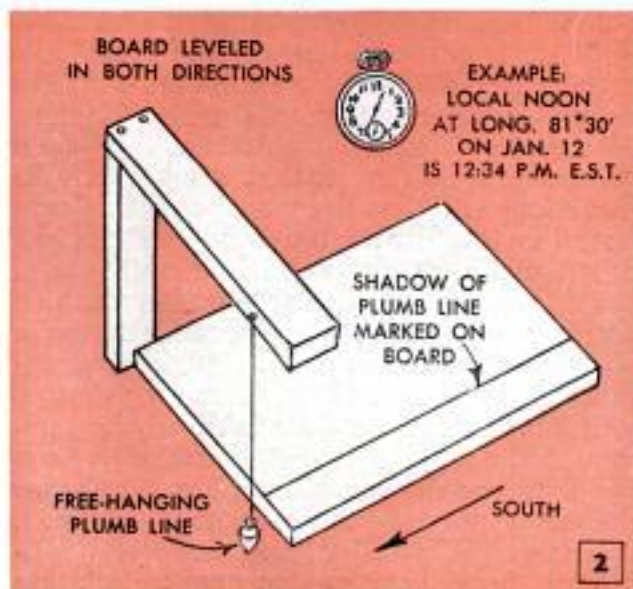
The second correction is necessary to make local noon—the time when the sun is due south and at its highest point in the sky—agree with noon according to standard time. The necessity for this becomes obvious when you take into consideration the fact that standard-time zones are based on the sun, or local, time at the nearest meridian. So, unless you live right on a meridian, the sun time shown on the dial will be slow if west of the meridian or fast if east of that line. To compensate for the difference in time, find your location on a map to the nearest half deg. (30 min.) of longitude. Then determine the difference between your longitude and that of your standard-time meridian. Each deg. of difference equals 4 min. variation in time. Thus, if you are 3 deg. west of the time meridian, 12 min. would be added to the dial time to obtain standard time. If you are the same distance east of the meridian,

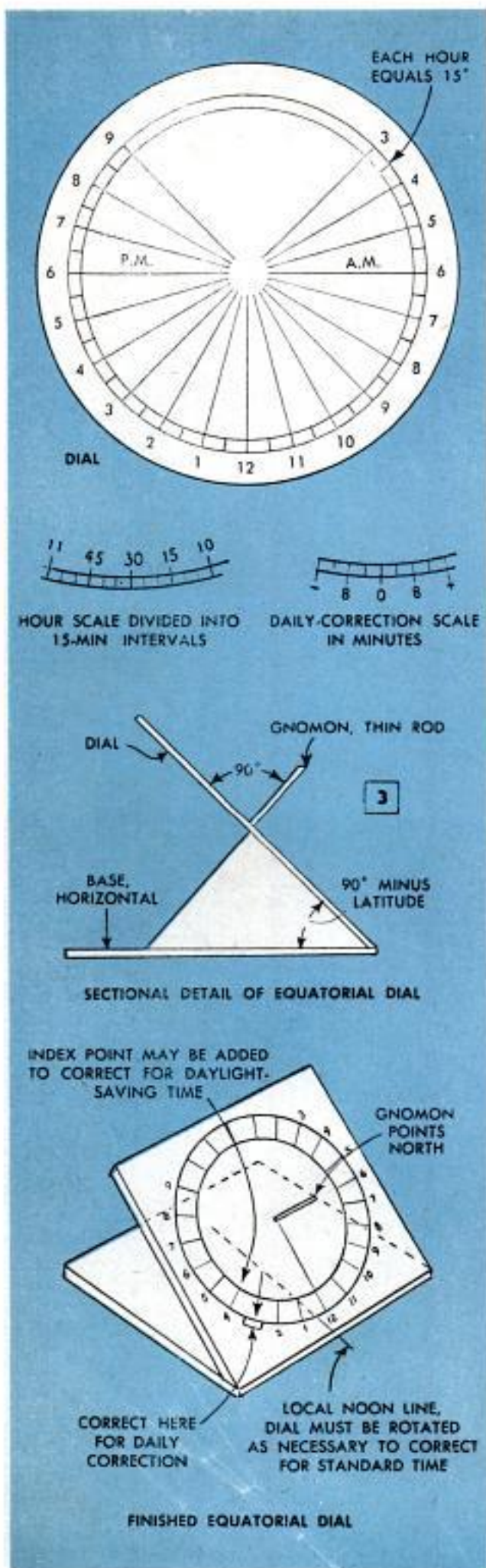
The photo at the right pictures a vertical declining sundial. This dial declines a few degrees toward the east so base of style falls in morning hours

DAILY CORRECTION TABLE

Date	Minutes	Date	Minutes
Jan. 1-6	+ 4	Aug. 1-4	+ 8
7-16	+ 8	5-25	+ 4
17-31	+12	26-31	0
Feb. 1-29	+14	Sept. 1-7	0
March 1-11	+12	8-18	- 4
12-25	+ 8	19-30	- 8
26-31	+ 4	Oct. 1-14	-12
April 1-7	+ 4	15-31	-16
8-25	0	Nov. 1-21	-16
26-30	- 4	22-30	-12
May 1-31	- 4	Dec. 1-3	-12
June 1-3	- 4	4-12	- 8
4-23	0	13-21	- 4
24-30	+ 4	22-28	0
July 1-16	+ 4	29-31	+ 4
17-31	+ 8		

To obtain civil time, add or subtract the number of minutes shown from the reading on the sundial





you would subtract 12 min. This correction remains the same throughout the year and may be incorporated permanently into the sundial.

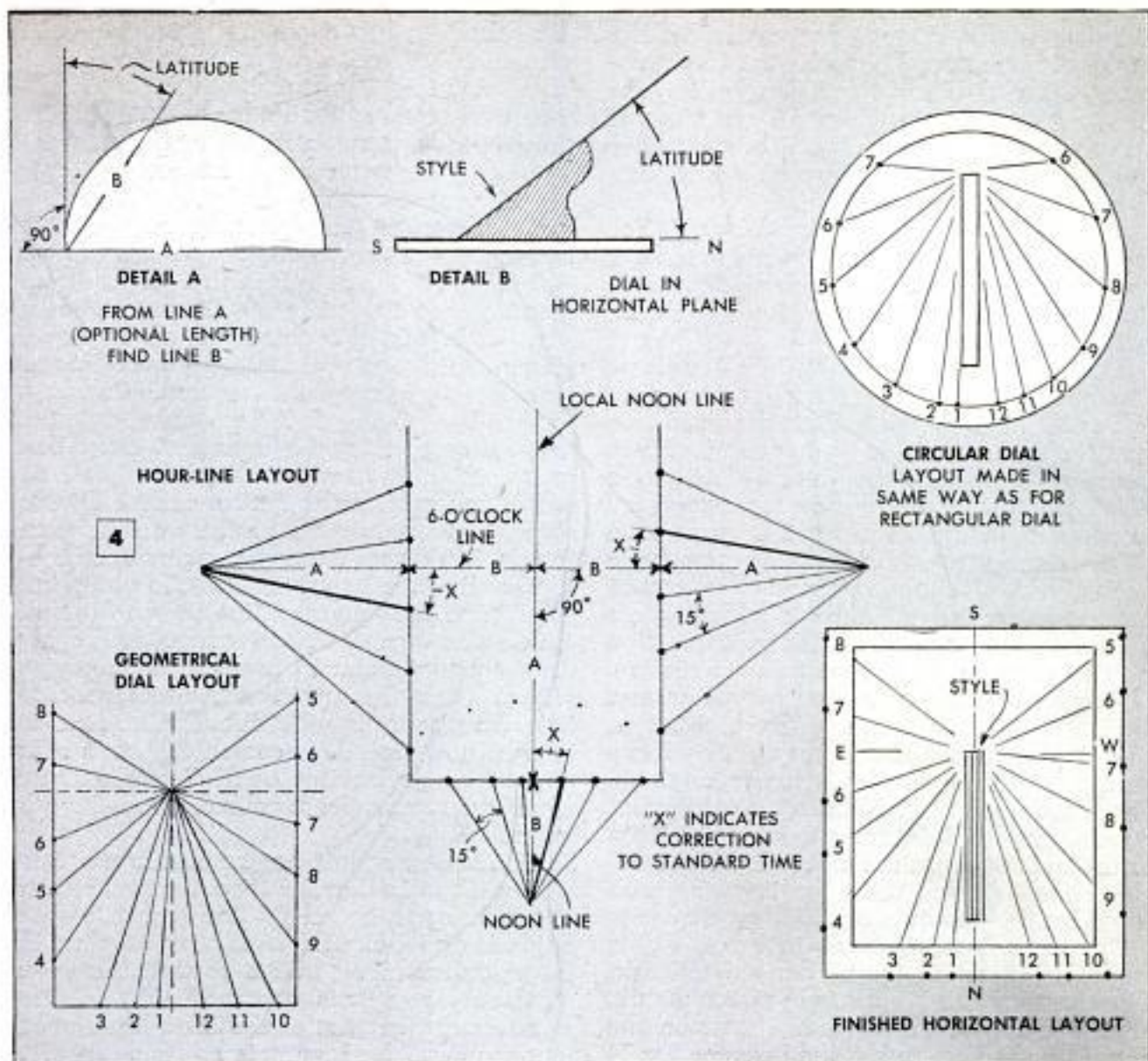
Your time zone is determined by the following meridians: Eastern Standard Time, 75 deg. W.; Central Standard Time, 90 deg. W.; Mountain Standard Time, 105 deg. W.; Pacific Standard Time, 120 deg. W.

The easiest method of finding the local noon line, which is the basis of the sundial, is shown in Fig. 2. First find the standard-time correction, as mentioned in the preceding paragraph, and check with the table to find the daily correction. Then set your watch accurately. The next step is to set up a board and free-hanging plumb line, Fig. 2, in the location in which you will set up the sundial. The shadow cast on the board by the plumb line will indicate local noon when the time on your watch reads noon plus or minus the two corrections. Note the example in Fig. 2.

Layout and construction of an equatorial sundial are detailed in Fig. 3. As in the upper detail, the noon line is established first and the hour lines are laid out at 15-deg. intervals in both directions from the noon line. Each hour is divided into 15-min. segments which, in turn, are marked off in 5-min. divisions. If the dial plate is mounted on a backboard so that it can be rotated slightly, a daily correction scale may be incorporated the correction. The scale is graduated in 4-min. intervals to indicate a maximum of plus or minus 16 minutes.

Although the dial can be any diameter desired, a diameter of $7\frac{1}{2}$ in. is convenient. This makes the hour segments about 1 in. long and facilitates marking the minute divisions. The gnomon should be a straight length of thin rod, preferably brass or aluminum, mounted vertically in the center of the dial.

The leveled board which you used to find the local noon line can be used as a base for the dial or a replacement base can be made of more substantial material. This, of course, must be located and marked carefully to be sure that it is level in both directions and that the position of the local noon line is accurate. As shown in the lower detail of Fig. 3, the noon line on the dial should be aligned with the local noon line, with the gnomon pointing north. The angle of the dial plate to the base, which is horizontal, should be 90 deg. minus the deg. of latitude. This setup thus inclines the gnomon to the north at an angle to the horizon equal to the degree of latitude. Note that this corresponds with the diagram in Fig. 1. If carefully installed and properly calibrated, the dial can be expected to tell time



within a range of about 2 minutes, plus or minus.

Of the several types of sundials which will tell time throughout the year, the horizontal dial is the most popular and is frequently seen mounted on top of a concrete column in the center of a formal garden. A somewhat similar dial, designed for installation on outside wall surfaces, is called a declining vertical dial.

The horizontal dial is detailed in Fig. 4, the same layout being used whether the shape of the dial plate is round, square, hexagonal or any other geometric pattern. The popular round design mounted on a concrete column is shown in the photo below Fig. 4.

Note in the hour-line layout in Fig. 4 that there are two critical dimensions involved—the lengths of lines A and B. The first step is to decide on a length for line A, determining it by the size of dial you want to make. Then, as in detail A, use line A as a diameter and scribe a half circle. From one end of the half circle, lay out a line perpendicular to the base, A. Then, using the deg. of latitude as the angle, draw in line B from the base of the perpendicular. The length of line B is determined by measuring from the base to the point where the line intersects the arc of the half circle.

On the hour-line layout, line A becomes a portion of the local noon line. From the upper end of line A, line



B is drawn at right angles on each side. The line B-B forms the 6-o'clock line. Using the ends of line B-B and the lower end of line A as reference points, draw three sides of a rectangle perpendicular to the reference lines, as shown. Extend both ends of line B-B a distance equal to line A to establish a point on both sides of the rectangle for laying out the hour lines. Extend the lower end of vertical line A a distance equal to line B for laying out the hour lines at the bottom of the rectangle.

The standard-time correction should be incorporated into the horizontal dial at this stage of the layout. Both the noon line and the two 6-o'clock lines are moved as indicated by X in the detail. The angle X is equal to the number of deg. necessary to correct for standard time in your area as previously mentioned. In the example in Fig. 4, the location of the dial is west of the meridian and the time is added. Were the dial east of meridian, the X correction would be made in the opposite direction.

Then, using the relocated noon line and 6-o'clock lines as bases, draw in lines at 15-deg. intervals. Mark the sides of the rectangle where the lines intersect them. From the upper end of line A, at the point where line B-B intersects it, draw lines to the marks along the sides of the rectangle. These become the hour lines, as indicated by the geometrical dial layout.

The style is cut out as in detail B, its angle being equal to the deg. of latitude. The apex of the style angle points south, or to the top of the layouts shown in the details, and is located at the intersection of lines A and B-B. The style should be of thin material or both sides of its top edge should be carefully beveled to cast an accurate shadow. The finished style is mounted directly over the local noon line.

The declining vertical dial, detailed in Figs. 6 and 7, is designed for mounting on any wall that faces in a southerly direction. The angle of declination is the angle that the wall deviates from south. If there were no angle of declination; that is, if the wall faced directly to the south, the dial would be laid out in almost the same way as a horizontal dial. The only difference between the horizontal and vertical dials, in this case, would be the use of the deg. of latitude when determining line B, as in Fig. 6, detail A.

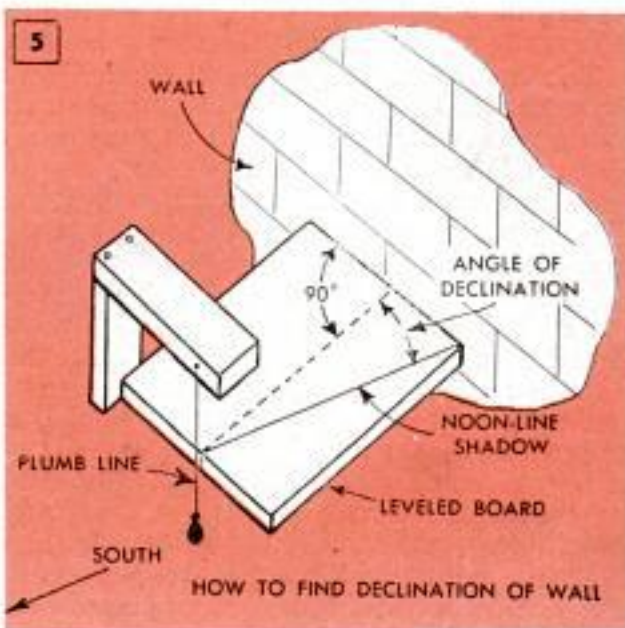
To make the declining vertical dial, it is first necessary to find the angle of declination. This is done as in Fig. 5, using a leveled board and a plumb line to cast a shadow of the noon line. Use the same method for finding the noon line as that referred to in Fig. 2, except that in this case the board is mounted against the wall instead of being faced due south. When the noon-

line shadow is cast on the board, draw in the noon line and draw a line at right angles to the wall to meet the noon line at the outer edge of the board. The angle formed by the noon line and the perpendicular is the angle of declination.

The lengths of the various lines necessary to lay out the declining vertical dial are figured as in the upper details of Fig. 6. Following the details A to E in sequence enables you to determine the line lengths for the layout plus the angle of the style. Here again, the optional length of line A controls the size of the sundial. First layout line A to the decided length, using it as a diameter, scribe a half circle. Then draw in line B, as indicated in detail A. After measuring the length of line B, use it as a diameter and scribe another half circle. In this case, use the angle of declination to find the length of line C, as in detail B. To find the length of line D, use the half circle having line A as its base, and draw in a perpendicular at one end of the base. Then, using the angle of declination, find the length of line D, detail C. Detail D shows how line A becomes the base of a right triangle, having the degree of latitude as the known angle, to determine the length of line E.

The style angle is determined from lines A and C, as in detail E, and the style itself is made as in detail F. The length of the style is optional. The base of the style will be mounted along line E so that the apex of the style angle is at point F.

After the lengths of the lines have been determined, the layout is made as in Fig. 7. Approximately the same procedure is used as that for laying out the horizontal dial. Note that the noon line is located by drawing line D at right angles to the lower end of line E. Line D is drawn to the left of line E for a dial which declines to the

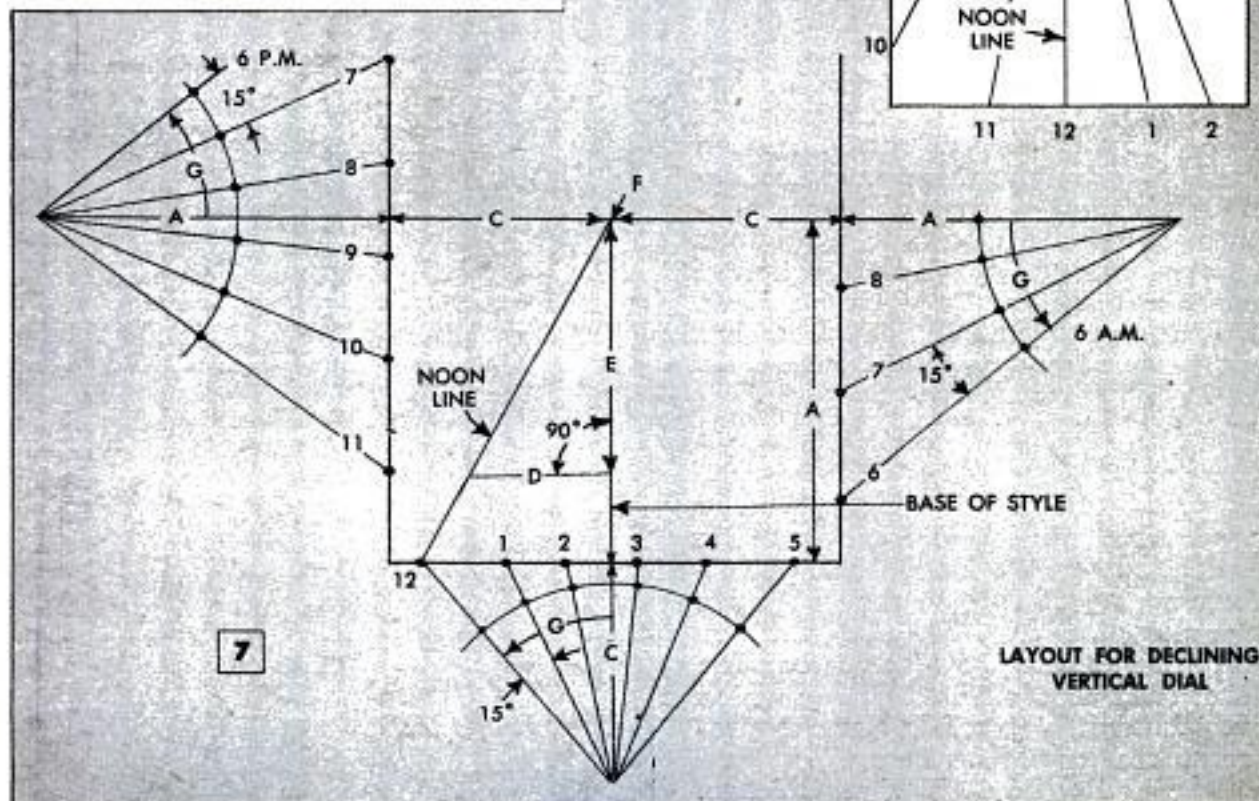
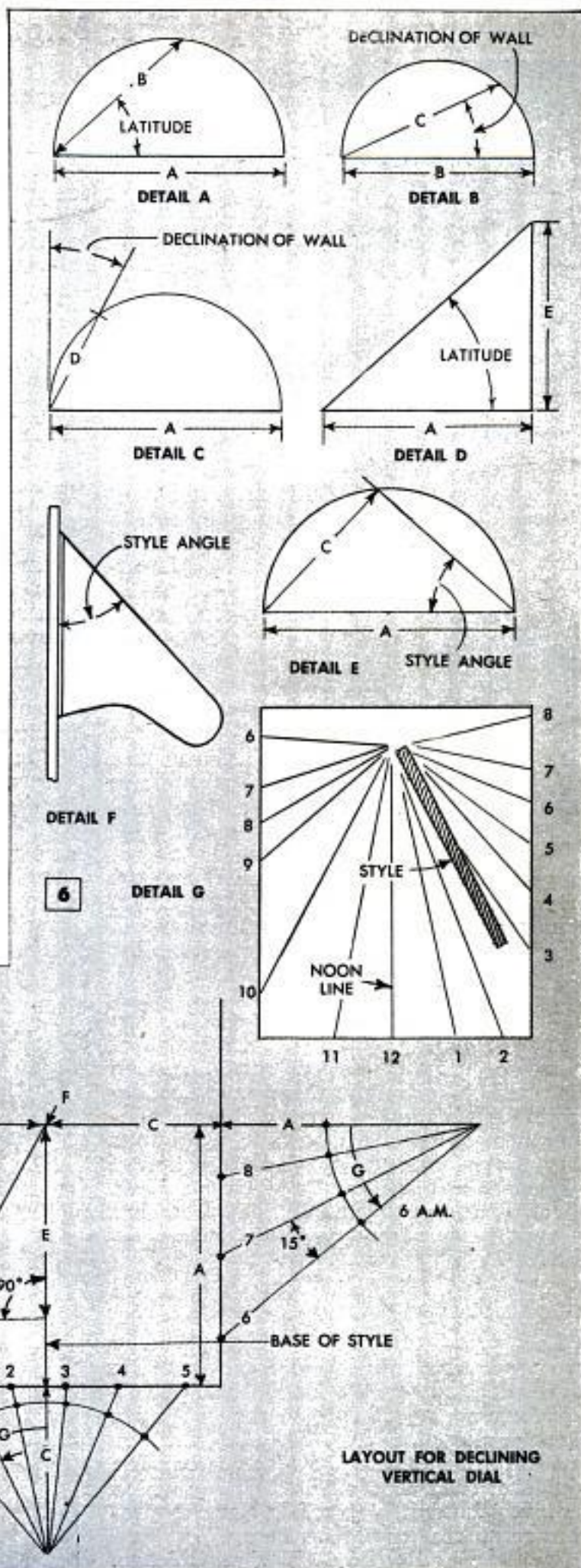


west. If the dial declined to the east, as it would if mounted on the wall in Fig. 5, line D would be added to the right of line E:

Line E is extended below the bottom of the rectangular layout a distance equal to line C. Then a line is drawn between the bottom of line C and the end of the noon line. The hour lines, from noon to 5 P.M., are laid out at 15-deg. intervals from this line. At this point, the angle G is measured as indicated and transposed to both the right and left-hand sides of the layout to determine the 6 A.M. and 6 P.M. lines. The standard-time correction also can be added at this time. This is done in the same way as shown in the hour-line layout in Fig. 4, angle X, adjusting all the hour lines in the same manner as for the horizontal dial.

The balance of the hour lines are laid out by using the 6-o'clock lines as bases. After the hour lines are all drawn to the center point, F, the layout is turned to bring the noon line in the vertical position. The finished layout is shown in Fig. 6, detail G.

When mounting the declining vertical dial on a wall, it is best to use a plumb line to be sure that the noon line is vertical. Be sure, however, that in mounting the dial, you do not change the angle of declination. The style should be vertical to the dial plate. ***



Boat Reinforced by Glass Fiber Before Installing Larger Engines



To allow for the added thrust of two new engines of greater horsepower, the hull of the fishing cruiser in the photograph is being strengthened by the application of three layers of glass fiber, bonded with plastic resin. The hull was scraped and cleaned, after which a small area was coated with resin and the glass fiber applied. This was repeated until the entire hull bottom was covered. Next, a coating of resin was applied over this layer of glass fiber. Two more layers of glass fiber then were applied in the same manner. Further advantages of the glass fiber are that it will completely seal the hull against water and requires little or no maintenance.

Brush Wiper Cut From Extra Lid



A paintbrush wiper, made by cutting an extra can lid in half, will aid in keeping excess paint inside the paint can. Place the half-lid on the can, then press it into a slightly concave shape so paint wiped from the brush will drain back into the can. File the cut edge

of the lid to remove the sharp edge that might cut the bristles of the brush. As most cans take a standard lid, the wiper can be interchanged.

William B. Eagan, Louisville, Ky.

Garden-Hose Clamp on Blowtorch Provides Soldering-Iron Rest

An ordinary garden-hose clamp can be used to improvise a rest for heating a soldering iron on a blowtorch when no rest is provided. Slip the clamp over the burner as shown in the sketch and tighten the clamp screw snugly. The



handle of the soldering iron should rest on the torch-valve handle. It may be necessary to file a small flat or groove in the valve handle to receive the soldering iron.

Bizarre Sign Warns Motorists to Watch Out for School Children

A broken bicycle, the grim remains of a tragic automobile accident, has been mounted on a post to serve as a safety reminder to motorists driving along a highway near one schoolhouse in Columbus City, Iowa. This graphic demonstration of what speeding and carelessness can do is effective in causing approaching motorists to reduce speed and watch carefully for children playing on or near the road.

Plastic Cleans Glass Slides

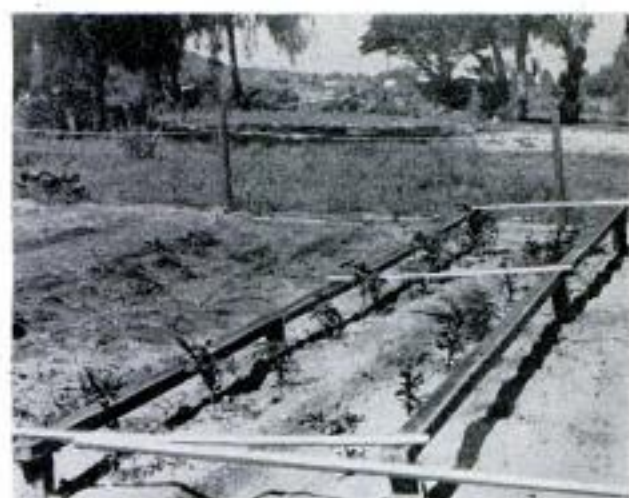
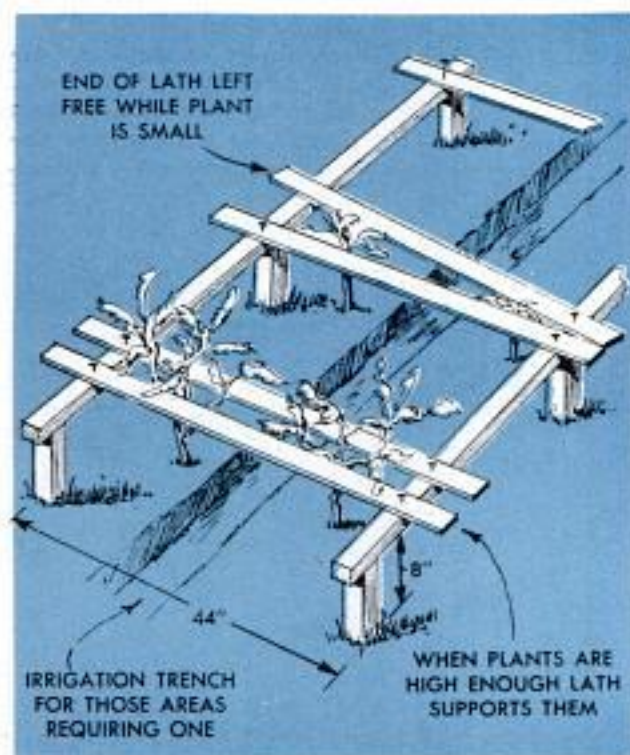
The rayon-plastic cloth sold by grocery and department stores under various trade names does not shed lint, and thus is excellent for cleaning color-slide glass, negative carriers and other surfaces that must be lint-free. Its texture, however, seems too rough for satisfactory lens cleaning, which requires the softest possible cloth to prevent scratching of the surfaces.

Robert C. Florian, Chicago.



Tomato-Plant Rack Helps Produce Better Crop

Healthier tomatoes will result if you build this tomato-plant rack for your crop this year. Follow the detail in constructing it, setting the posts only deep enough in the ground to prevent wobble. After the plants are up, keep them trimmed to the edge of the lath. Don't hesitate to cut off branches that spread beyond it, even though they are loaded with blossoms. The trimmed vines will produce more tomatoes of a higher quality than if untrimmed.



While the plants are small, above, the laths are not used. Below, when the plants are high enough, the laths are put in place to give them proper support



Wire Shrub "Lifter" on Sprayer Exposes Underside of Leaves

It is often difficult to spray the underside of leaves where many destructive insects, such as aphids, are found. However, by fitting this wire snap-on attachment to your sprayer, branches of shrubs can be lifted up to expose the underside to a shot of

insecticide. The attachment is simply a length of wire bent U-shape to extend about 10 in. beyond the sprayer nozzle. The ends of the wire are soldered to a spring clip which snaps around the sprayer.

Eaves-Trough Overflow Controlled

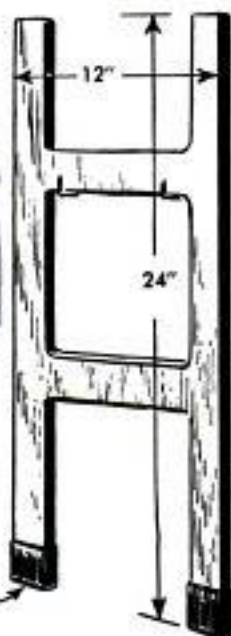
Troubled with the problem of rainwater overflowing the wooden eaves troughs on his house and causing stains where it ran down the sides, one homeowner nailed ordinary wooden lath along the outer edges to provide a drip cap for the length of the trough. This arrangement causes the overflowing rainwater to drip to the ground from the bottom edge of the lath, instead of following the curve of the eaves trough and running down on the wall as before. The lath was painted to match the color of the eaves trough. — William Cogeos, Croton-on-Hudson, N. Y.



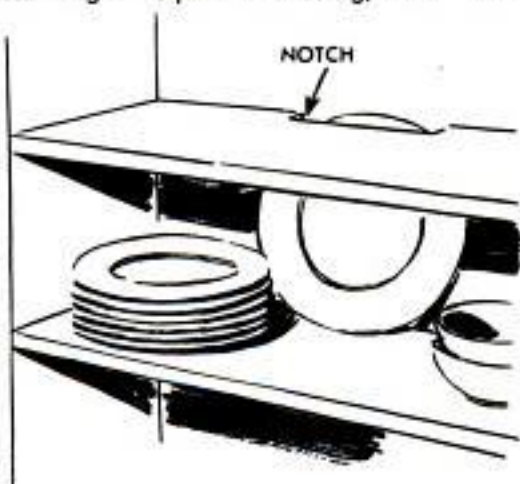
Solving HOME PROBLEMS



A LIGHTWEIGHT LADDER, cut from $\frac{3}{4}$ -in. plywood, brings overhead shelves within reach. Ladder is 12 x 24 in. with nonskid section of rubber hose tacked to each leg. Small hooks store it on wall or door

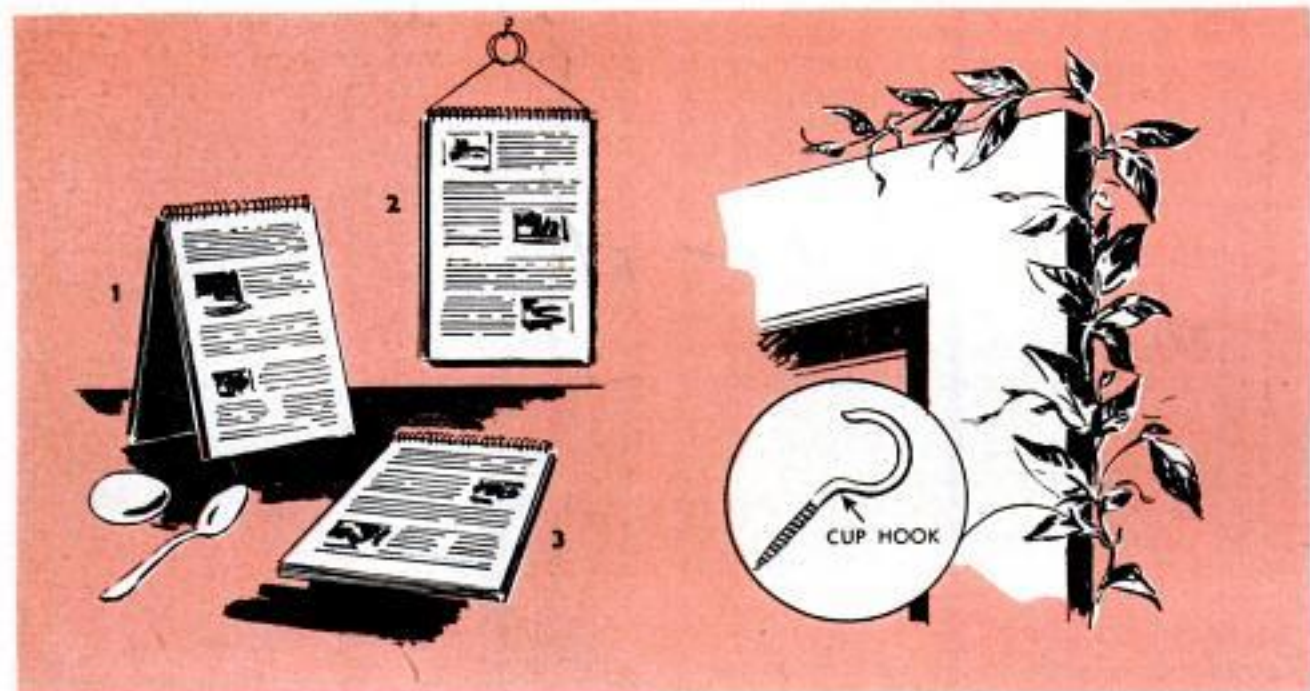


LARGE PLATTER that is too big to be stored on existing cupboard shelves in either flat or horizontal position can be accommodated by sawing a notch in the upper shelf. Thus the platter will be held upright, occupying little space. Readjusting the shelves, which might require rebuilding, thus is avoided



FAVORITE RECIPES are more readily usable if they are written or pasted in a spiral-bound stenographer's notebook. The book can be placed upright, 1, may be fitted with a cord run through the binding, 2, and tied to a metal ring to permit hanging flat against the wall at eye level, or, 3, will lay flat on the table

CLIMBING VINES may easily be trained to grow around a door or window frame by using small cup hooks. The slender shank of the hook leaves only a tiny hole in the frame if it is removed and the growing vine quickly covers the hook. If cup hooks are not available, they can be improvised from screw eyes





A PIECE OF FELT, cut to fit over the top of the container of an insecticide sprayer, as shown above, will absorb any liquid that leaks from the nozzle. Felt from a discarded hat, or a paper blotter may be used. Unscrew the container, cut the felt or paper blotter to fit, then reassemble the sprayer

ALWAYS HANDY and difficult to misplace, the clothesline reel, shown below, is drilled to permit it to be threaded directly on the clothesline. The reel is sawed from $\frac{1}{4}$ -in. plywood of a size to suit the length of line used. The reel may be varnished to protect it from weather and to aid in easy cleaning



PLASTIC SHOE BAG, with its many pockets, can be used to provide a toy rack for small-fry equipment. The bag requires a minimum of floor space; it can be hung inside a closet door or on any wall. The plastic will conform to any shape of object dropped into it and can easily be cleaned with a damp cloth



JUNE 1954



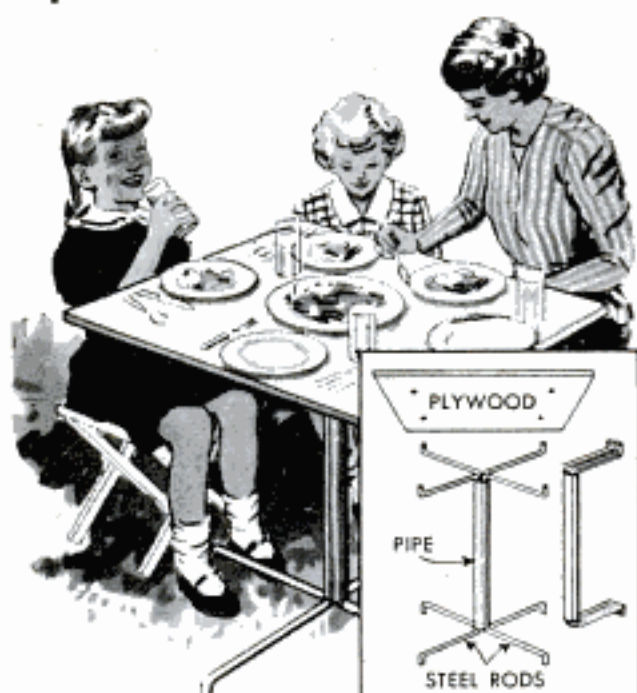
LARGE BOOKS or catalogues, used to provide a temporary high chair, as in the illustration above, so as to enable a youngster to eat at the table, should be held securely to the often slippery chair. Slip a length of heavy twine through the center leaves of the book and tie the ends to the back of the chair

POURING GROUND COFFEE from a newly opened can into a cannister, usually results in spilling at least a small amount. The spilled coffee is difficult to wipe up and, on linoleum, will grind annoyingly underfoot. Wrapping a paper towel around the can, as shown in the photograph below, will overcome this problem



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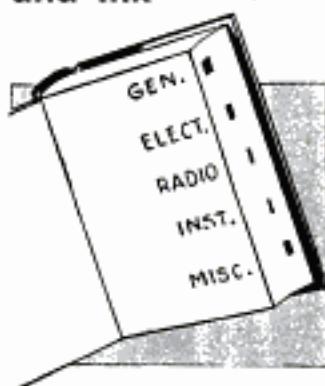
Pipe Section and Bent Rods Form Legs of Folding Picnic Table



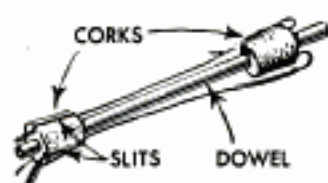
A folding picnic table, ideal because of the small space required for packing, can be made as shown. Four long steel rods are inserted in a pipe of suitable length and bent to form supports. The table top is made of plywood, with blind holes drilled in the underside to receive the ends of the upper support arms. For outdoor use, the bent tips of the lower support arms are pushed into the ground to give the table stability. For indoor use, rubber suction cups can be fitted over the bent tips to prevent marring the floor.

Handy Thumb Index for Book Made With Pen and Ink

Any book can be given a thumb index quickly and easily, with a pen and ink as the only items needed. On the right-hand edge of the first flyleaf, copy the chapter headings in a vertical column as shown in the illustration. Directly below each heading, color the edges of the pages to which each heading refers, using black or colored ink. Wanted information is now easily found by first locating the desired chapter heading on the flyleaf and then opening the book on the inked area under it.—Eugene Lee Burner, Morgantown, W. Va.



Dowel Stores Snelled Fishhooks

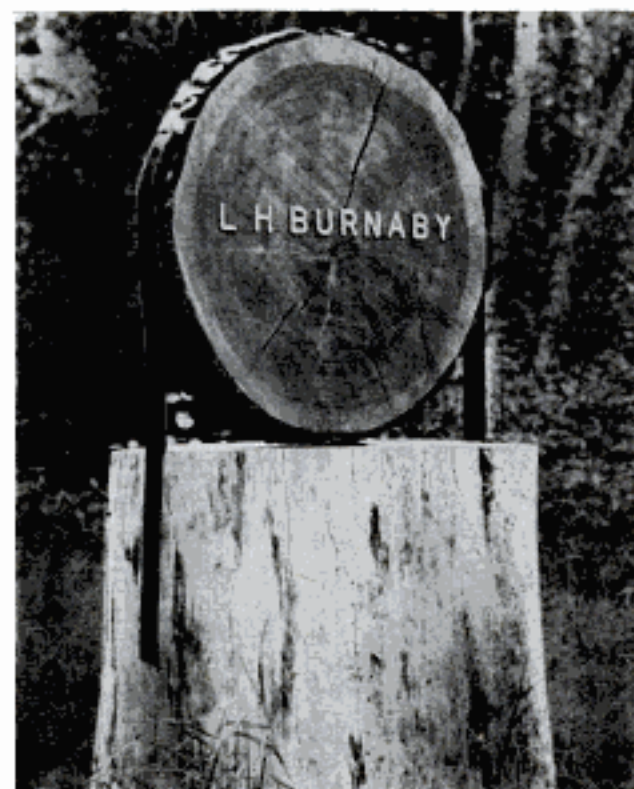


To hold snelled hooks for easy selection and avoid having their leaders tangled in the tackle box, drill two corks to fit snugly over a

small dowel about 8 in. long. Slit the sides of one cork to hold the leaders and press the hooks into the other cork. The distance between the corks can be adjusted as needed.

Large Tree-Trunk Sections Used as Attractive Sign

One cottage owner, searching for a novel and attractive nameplate for the entrance to his driveway used a section of a large tree, mounted and lettered as shown. Heavy iron straps are spiked to the section and to the base, which in this case was a large tree stump. The letters can be jigsawed from 1/4-in. exterior plywood, or they can be painted on or burned into the wood. Trunk section should be treated with a wood preservative to prevent decay.



Removing Chocolate Stains

Chocolate stains can be removed from a rug or upholstery by washing with lukewarm water, after which a small amount of pepsin powder, available at any drugstore, is rubbed into the stain. The powder is allowed to remain on the stain for half an hour and then sponged off.

Ted Otsu, Vancouver, B. C., Can.

Inexpensive Back-Door Canopy Made From Auto-Trunk Lid

One home craftsman used the trunk lid of an old sedan to make a serviceable and inexpensive canopy for the back door of his home. A 2 x 2-in. support is bolted to the inside bottom edge of the lid, and the assembly is anchored to the wall over the door with ¼-in. anchor bolts and lead shields. The hinge-bolt holes of the lid are plugged, and an outdoor light socket can be attached through the lid-handle hole. To dress up the final appearance, wrought steel supports can be bolted in place.

Le Roy Olson, Ogden, Utah.

Fishline Shot Changed Quickly If Clamped to Length of Line



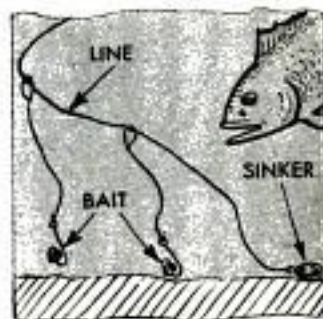
For the stream fisherman, the method shown offers a simple way of quickly changing the number of split-shot sinkers used. To rig the line in this manner, tie a loop in it, and then cut one side of the loop near the knot. Clamp the neces-

sary shot to this length of line. More shot is used for fast water, and for slow water shot is removed by pulling it over the end of the line. Another advantage of attaching shot in this way is that the sinkers will pull off if snagged between rocks or other obstructions, allowing the line and lure to be retrieved.



Tackle Rigged for Catching Carp

When going out to catch carp, one fisherman rigs his line as shown to increase his catch. The baited hooks on leaders are tied to the line above a sinker. When rigged in this way, the hooks offer little resistance to the carp taking the bait and allow the fisherman ample time to set his hook. A little slack should be given to the line.—Bill Keeney, Elksdale, W. Va.



Child's Play Pen of Roll Fencing Dismantled Easily for Storing



This outdoor play pen can be erected or taken down and rolled for storing in a matter of minutes. This is made possible by the use of wood-and-wire roll fencing that is held upright by sturdy corner posts of 1-in. pipe. The posts are slipped into short lengths of 1¼-in. pipe which are permanently embedded in the ground. The latter either may be set in concrete or placed in holes in the ground and held erect by cinders or crushed stone packed around them. The fencing is secured to the posts by means of cotter keys that are snapped over the top and bottom wires of the fence. The keys are inserted through holes drilled in the pipe at suitable height.

☐ Garden tools painted a bright orange are easy to see and are less likely to be forgotten when the work is finished.

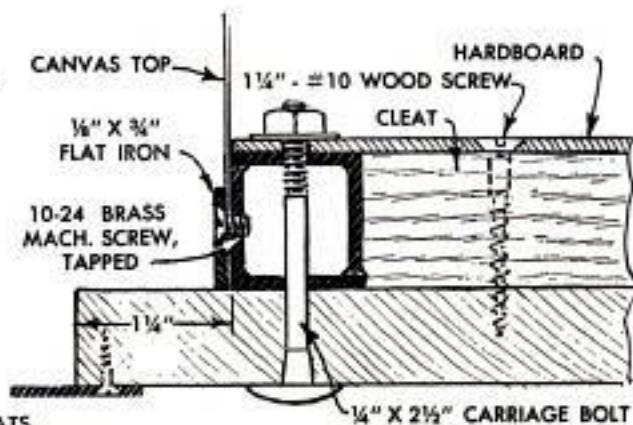
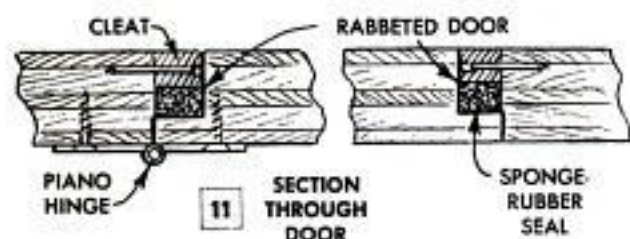


Compact as it is, Kendall's trailer has room for stowing table-and-chair set, stove and cooking utensils

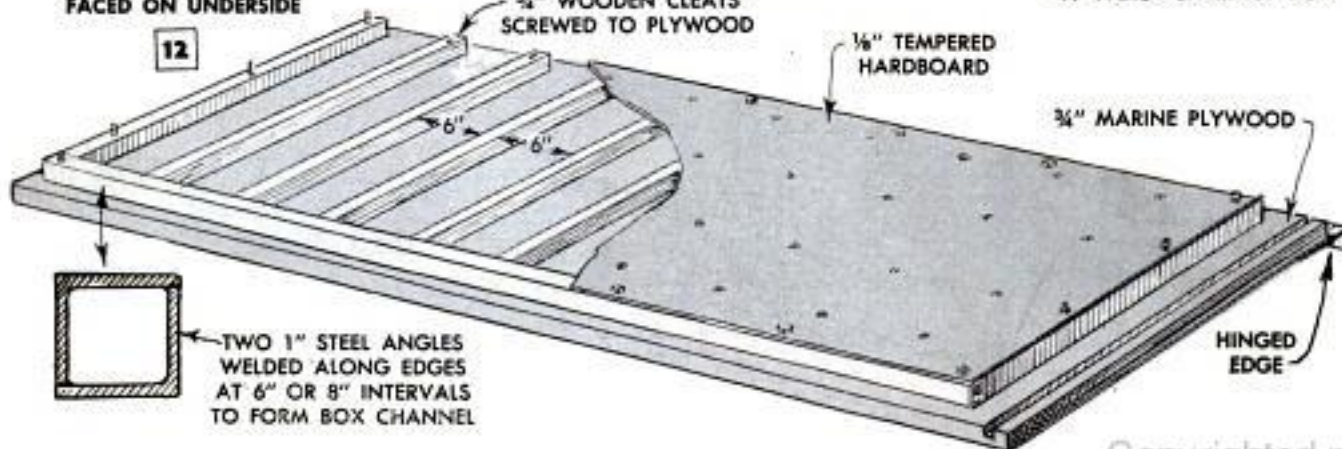
FAMILY CAMPING TRAILER

EDITOR'S NOTE: In part I, Jim Kendall explained how the bed and body of his trailer were welded together from channel and angle iron, how the ice chest was installed and how marine plywood was used to cover the outside. Part II concludes instructions for completing Kendall's "tent on wheels."

By Jim Kendall



HOW HINGED LIDS ARE FACED ON UNDERSIDE



W T M 56
SERVICE FILE BOOKLET #200

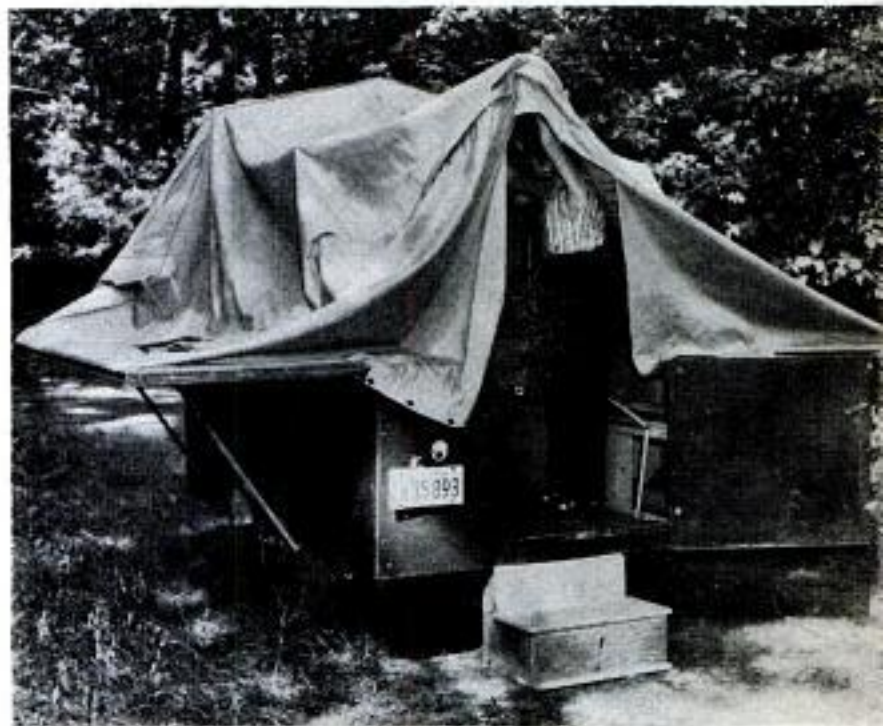
WITH construction completed to the point discussed last month, your next step is to add the framework to the underside of the trailer lids. This framework serves primarily as an anchor point to which the tent is permanently attached along each side. In studying Fig. 12, you'll notice that the framework consists of box channel on three sides over which tempered hardboard is applied and supported every 6 in. by wooden cleats. I made the box channel by placing two lengths of 1-in. angle iron together as shown and welding them along the edges at intervals of 6 to 8 in. The channel is bolted to the plywood lids approximately $1\frac{1}{4}$ in. in from the edge all around, using $\frac{1}{4}$ -in. carriage bolts long enough to also pass through the hardboard covering. Holes spaced about 8 in. apart are drilled and tapped in the outer faces of the box channel. These receive small machine screws which are used to fasten flat-iron, canvas-clamping strips to the channel. Flat-headed $1\frac{1}{4}$ -in. wood screws are used to fasten the hardboard to the cleats and the cleats to the plywood trailer lids.

With this step completed, you can turn to making the two folding platforms which are used to increase the width of the trailer lids so that standard 54-in. air mattresses can be used. Fig. 13 details the construction of the platforms and shows how they rest on the built-in seats when in use. They are made of $\frac{3}{4}$ -in. plywood and have three legs which are hinged to fold flat. Note that the top board overhangs at the rear so it can rest on the trailer lid and be flush with the hardboard. A suitable groove is run on the underside of the overhang to allow it to fit over the barrel of the continuous hinge supporting the lid. Over-all measurements of the platforms should allow clearance for the lugs to which the tent bracing is pivoted. The links which hold the legs open are made from short lengths of flat metal. When folded flat, the platforms are stowed on the seats. In rainy weather this makes it possible to still use the seats when eating inside the trailer.

Space under the seats on each side of the wheel wells is converted to storage compartments and fitted



To set up camp, wings of trailer to which tent is attached are first opened outward and supported by fold-away pipe braces



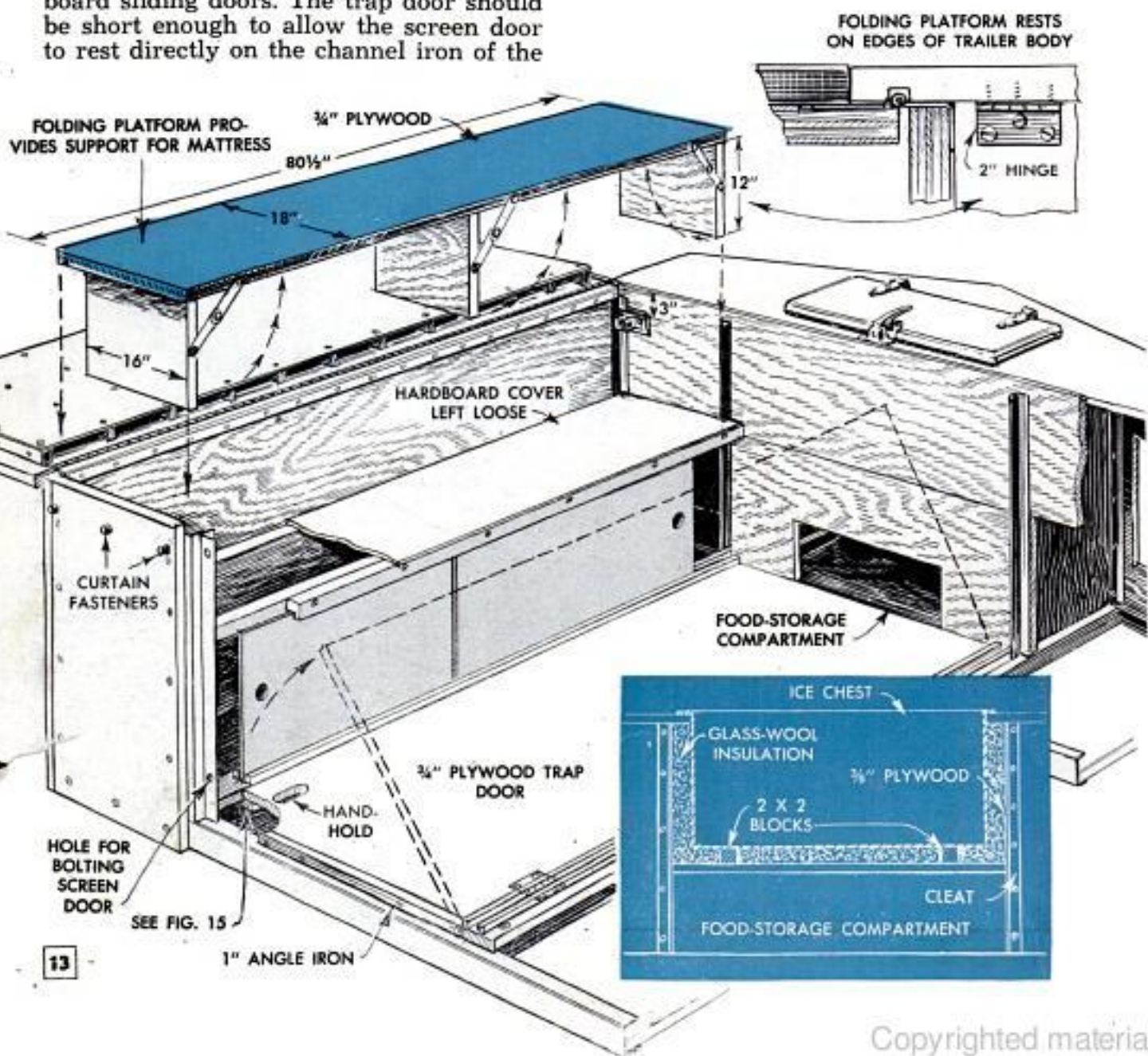
Above, pipe framework swings upward from trailer body to support tent roof like covered wagon. Steps under body keep trailer from tipping. Below, Jim Kendall buttons canvas to row of regular curtain fasteners which are added to front of trailer



with sliding doors of tempered hardboard. The cross-section view in Fig. 15 shows how tracks are made for the sliding doors. The upper track is formed by a rabbeted strip which is bolted to the face of the angle-iron seat rail, flush with the top. The lower track is formed by two 1/4-in. cleats nailed to a 3/4 x 2 1/4-in. strip which is bolted to a channel member of the trailer bed. The 1/4-in. cleats are lined up, of course, with the rabbet directly above. The 3/8-in. rabbet allows ample clearance for the two sliding doors so that any subsequent swelling will not cause them to bind. Handles are formed by boring a 1-in. finger hole in opposite ends of the hardboard panels. Stops for the hinged trap door in the floor, which affords access to a storage well below it, are bolted to the underside of the wooden channel strips. The stops run the full length of the door and you'll note that one edge of each one is rabbeted to fit over the edge of the iron channel. The trap door itself, below which the screen door is stored, is hinged along one side, the hinges being set flush so they will not interfere with the hardboard sliding doors. The trap door should be short enough to allow the screen door to rest directly on the channel iron of the

trailer bed when the door is set up. A handhold is cut in the lower left-hand corner of the door for easy lifting.

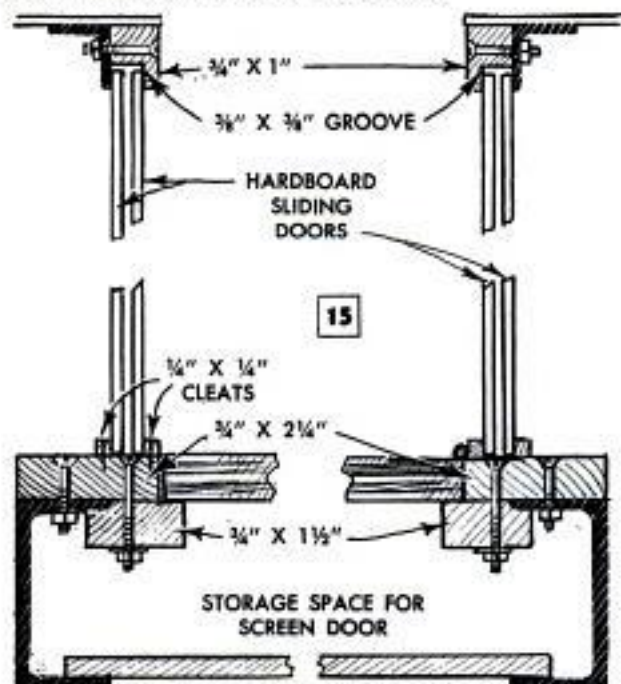
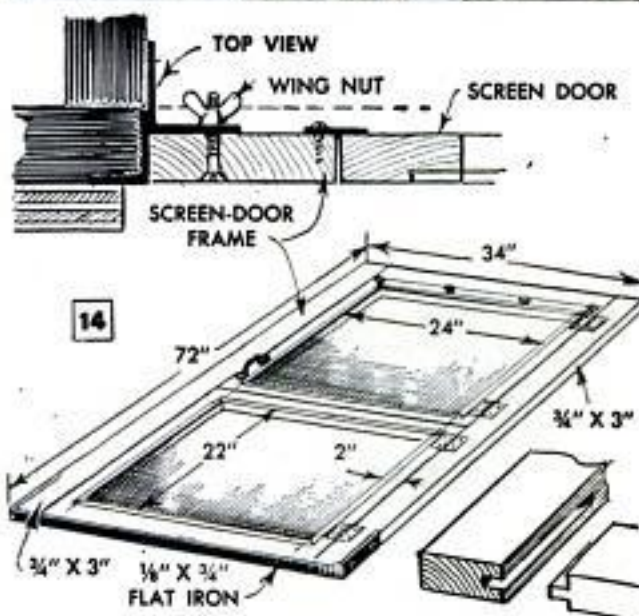
I made the screen door in one piece as you can see in the photo on the opposite page, although I since have converted it into a Dutch-type door as detailed in Fig. 14. This proved more convenient in that the door of the trailer itself could be closed and yet allow the upper part of the screen door to be opened independent of the lower section. The 3-piece frame for the door is made of 3/4 x 3-in. hardwood. I used mortise-and-tenon joints at the upper corners and braced them on each side with flat-iron mending plates. These corners could be doweled or held with corrugated fasteners. The doorframe is braced across the bottom with a flat-iron strip which I bent at right angles to extend up the sides of the frame, flush. Note that the upper section of the screen door is fitted with regular curtain fasteners to permit buttoning a canvas flap across the top. Curtain fasteners also are added to the doorframe, one on each side, in line with those previ-





Above, screen-door unit bolts to door opening and tent flaps button to doorframe. Right, screen-door unit stores in well under trap door in trailer floor

ously added to the trailer body for buttoning the tent top. The screen-door unit, which is installed after the tent top is erected, is held securely by four flat-headed stove bolts fitted with wing nuts. Holes for these are made in the doorframe to correspond with the holes previously drilled in the angle-iron pieces to which the frame is bolted. The top-view detail in Fig. 14 shows the wing nuts on the inside so they will not interfere with closing the trailer door. The handle for the screen door is attached to the upper section so it clears the trailer door when the latter is closed.

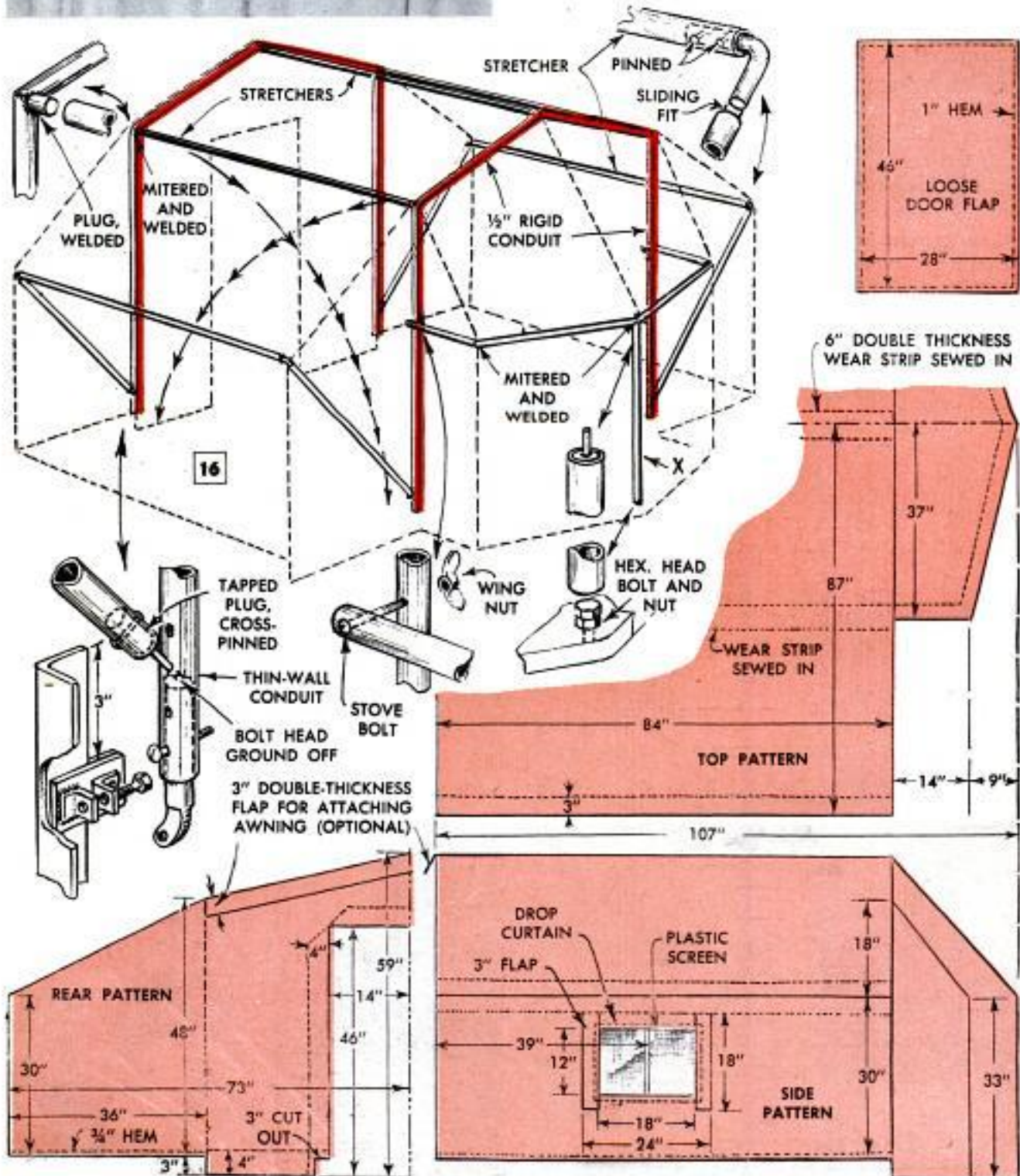




Left, drop-curtain tent window, which any awning maker can add, is installed on each side of trailer

Fig. 11 shows how I sealed the two access doors in the nose of the trailer with sponge rubber to make the storage compartments dust and water tight. Rabbeted edges around both door and door opening provide space for the rubber which is cemented to the cleats that form the inner rabbet. In closing, the door compresses the sponge rubber and seals the joint tightly.

This brings you to the tent and its supporting pipe framework. Except for the two main units of the framework which are shown red in Fig. 16 and which are perma-





Lock-fitted, rubber-sealed doors to storage compartments in nose of trailer are hinged with piano hinges

nently attached to the trailer body, all supporting members are designed to come apart to facilitate storing. The two main units are pivoted in welded angle-iron brackets bolted to the trailer body and fold flat. You'll notice here that height adjustment is provided to take up any slack in the canvas. I made the whole framework of rigid and thin-wall electrical conduit. The bows which stretch the sides of the tent, are fitted with pins in the ends to engage holes in the lower ends of the main supporting bows. Note that these side bows are made to come apart in three pieces. Pipe X serves as a prop to support the one-piece front bow. The lower end sets over a bolt-head stud in the trailer body, while the upper end has a pin to pass through a hole at the mitered joint.

In erecting the tent top, the main bows are swung up in position first, and then the three stretcher pipes are put in place over welded studs. Usually, there is enough play in the canvas top to permit the stretchers to be forced over the studs. Exact lengths of the various members that make up the framework are best determined from the actual tent itself as the over-all size of the tent will vary somewhat in each individual case.

Patterns for the tent accompany Fig. 16. I had this sewed together by an awning maker and suggest that you do, too. They know how to add the drop-curtain windows and are equipped to install the grommets for buttoning the tent to the trailer. The 3-in. flap indicated across the top of the rear pattern is optional. I had this sewed in at the time, as I plan to add a canvas canopy, supported by tent poles, over the door. The flap will provide a means of buttoning the canopy. ★ ★ ★

JUNE 1954

Rings on Garden-Trowel Handle Convert It to Depth Gauge

Rings painted on the handle of a garden trowel will convert it to a handy depth gauge to insure planting bulbs and seeds at the correct depth. Using a rule, mark off the trowel handle in convenient units. Then paint brightly colored rings completely around the handle at the unit marks. The bright colors also will make the trowel easier to find, should it become misplaced in the garden.

R. M. Woodbury, Ellsworth, Me.



Cleaning Plates With Powder Puff

One way of assuring sparkling glossy prints is by using a clean powder puff to polish the ferrotype plates. The puff is easy to use and provides a soft texture that cannot scratch the plate. —John J. Rea, Urbana, Ill.



Vials Stored Safely for Travel In Fingers of Knit Glove

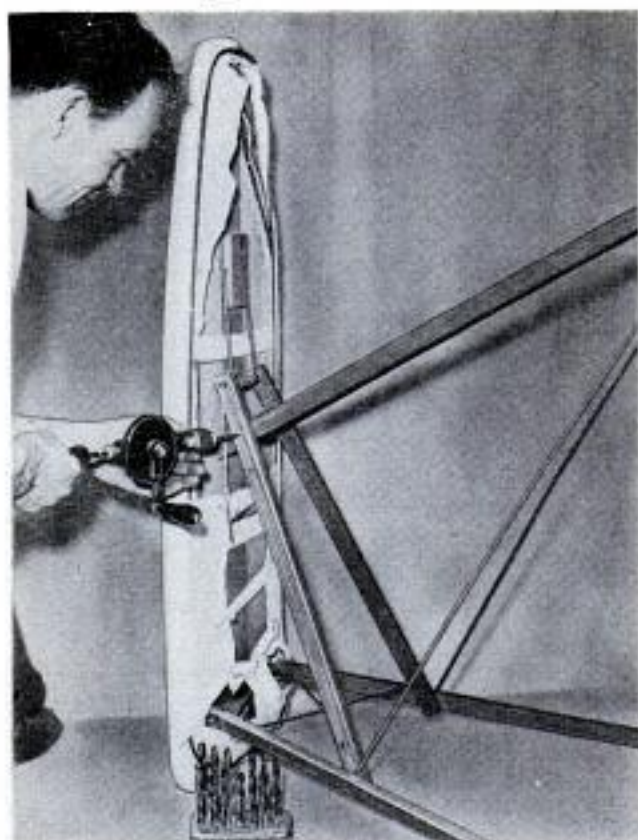
Glass developer tubes, perfume vials and other small bottles having a cylindrical shape can be stored safely in luggage when inserted in the fingers of a knit glove as shown. After inserting the bottles, snap a rubber band around the wrist of the glove and another around the fingers to hold them together securely.

John J. Rea, Urbana, Ill.



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Pin Through Joint Makes Wooden Ironing-Board Legs Rigid



To make the wooden legs of a folding ironing board more rigid and to prevent them from collapsing unexpectedly, drill a hole through the point where each front leg and brace cross when the legs are extended and insert a large nail as a pin. The nail should be a fairly tight fit in the hole to do the best job. Attach the pins to the board with a short length of cord so they will always be handy.

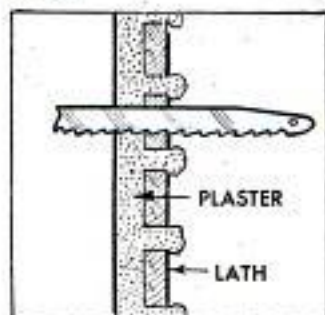
Ben Perry, Ketchikan, Alaska.

Tools Waxed to Simplify Use On Resinous Woods

When using a saw or plane on resinous woods, you will find the tools much easier to work with if given a coating of wax on surfaces that come in direct contact with the wood. Also, the movement of work about the top of a bandsaw or circular-saw table can be accomplished more easily if the top is coated with wax.—R. L. MacLean, High Bank, Prince Edward Island, Can.

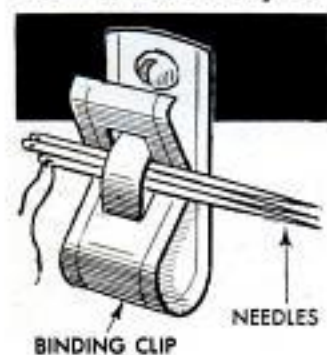
Openings Cut in Plaster Walls With Hacksaw Blade

When cutting openings in walls where wooden lath has been used, a saw usually will push the lath inside the wall and break the plaster key. A hacksaw blade with the teeth reversed so that it cuts when it is pulled toward the operator will prevent breaking the plaster. Grind a taper on the end of the blade to allow easier entrance and wrap the blade with friction tape for a handle.



J. R. Paquin, Worcester, Mass.

Sewing Needles Quickly Located When Held by Binding Clips



The problem of keeping track of small sewing needles may be solved by utilizing binding-post clips of the type shown by the illustration. Each clip will hold several needles

which are released by applying finger pressure to the clip spring. These clips are available at radio-supply houses.

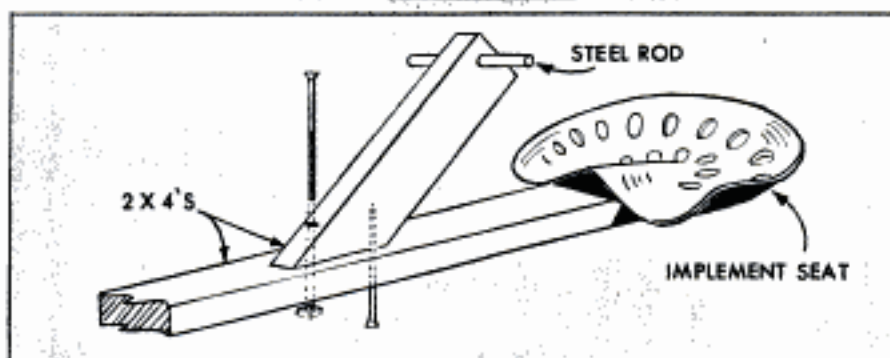
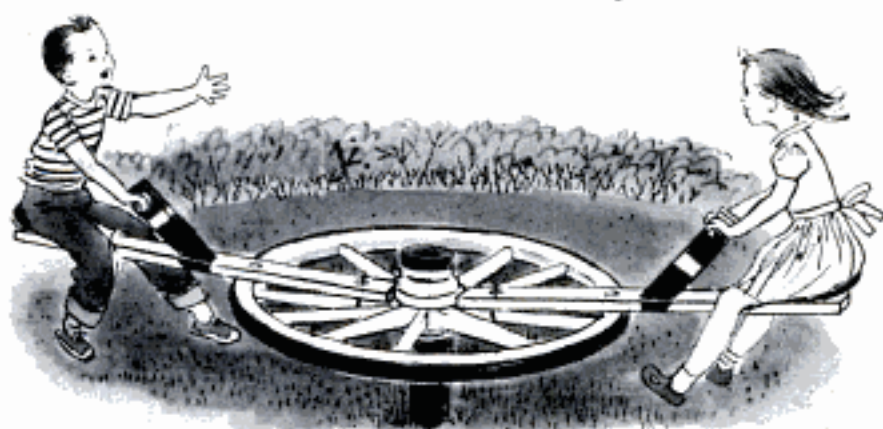
Substitute Buffing Compound From Candle and Chalk

A buffing compound with a mild abrasive quality can be improvised from a wax candle and a piece of ordinary blackboard chalk, when no jeweler's rouge or other buffing compound is available. Touch the candle to the buffing wheel lightly, so that some of the wax is picked up by the wheel. This will act as a binder for the chalk, which is touched against the turning wheel next. With the wheel thus charged, proceed with the buffing, recharging when necessary by applying more candle wax and chalk.—Ken Murray, Colon, Mich.

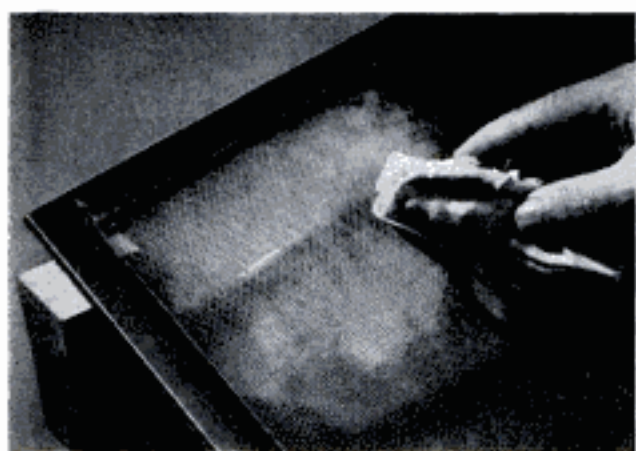


Wagon Wheel and Axle Used for Children's Merry-Go-Round

The active youngsters of one farmer have hours of fun on this merry-go-round, which utilizes an axle and wheel from a discarded farm wagon. The axle was set vertically in the ground to project 2 ft. above the surface. The earth was tamped down around it to make it a firm support. Then lengths of 2 x 4s were bolted to the wheel, using carriage bolts through the felly and J-bolts around the spokes at the end of each 2 x 4 piece. A steel rod or piece of pipe provided the hand grips and the seats were salvaged from junked implements. Finally, it was painted in gay colors.—A. W. Ranniger, Carroll, Iowa.



Window Screens Enamelled White Insure Hot-Weather Privacy



During hot weather when curtains are pulled back from windows for better ventilation, more privacy is assured if the outside surfaces of the screens are painted with white screen enamel. Sunlight is reflected from the white-enamelled surface, keeping the interior of the house cooler, as well as making it impossible to see in from the outside. Visibility from the inside, looking out, is not affected. Apply the enamel with a cloth pad, rather than brush or spray. The pad will prevent the enamel from "bleeding" through to the inside.

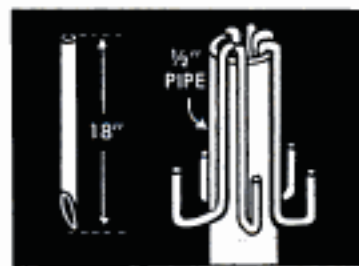
Ken Murray, Colon, Mich.

Portable Campfire Roasting Spit Fashioned From Pipe and Wire

A portable, easily made spit for use over an open fire can be fashioned from a piece of $\frac{1}{2}$ -in. pipe and several lengths of coat-hanger wire. "Point" the end of the pipe to be driven into the ground by hacksawing the end at an angle. The dimensions of the wire hooks are dependent on the sizes of the pieces of food to be cooked. Spare hooks of various sizes can be carried, along with the $\frac{1}{2}$ -in. pipe, in a holder made from a length of inner tube, one end of which is sewn shut and the other cut to form a flap.

Russ Jenkins, Chicago.

☞ To avoid puckering along the seam line of a shirt collar when ironing it, snap the damp collar in your hands to stretch the threads before applying the iron.



How to Remodel Your Home
X503

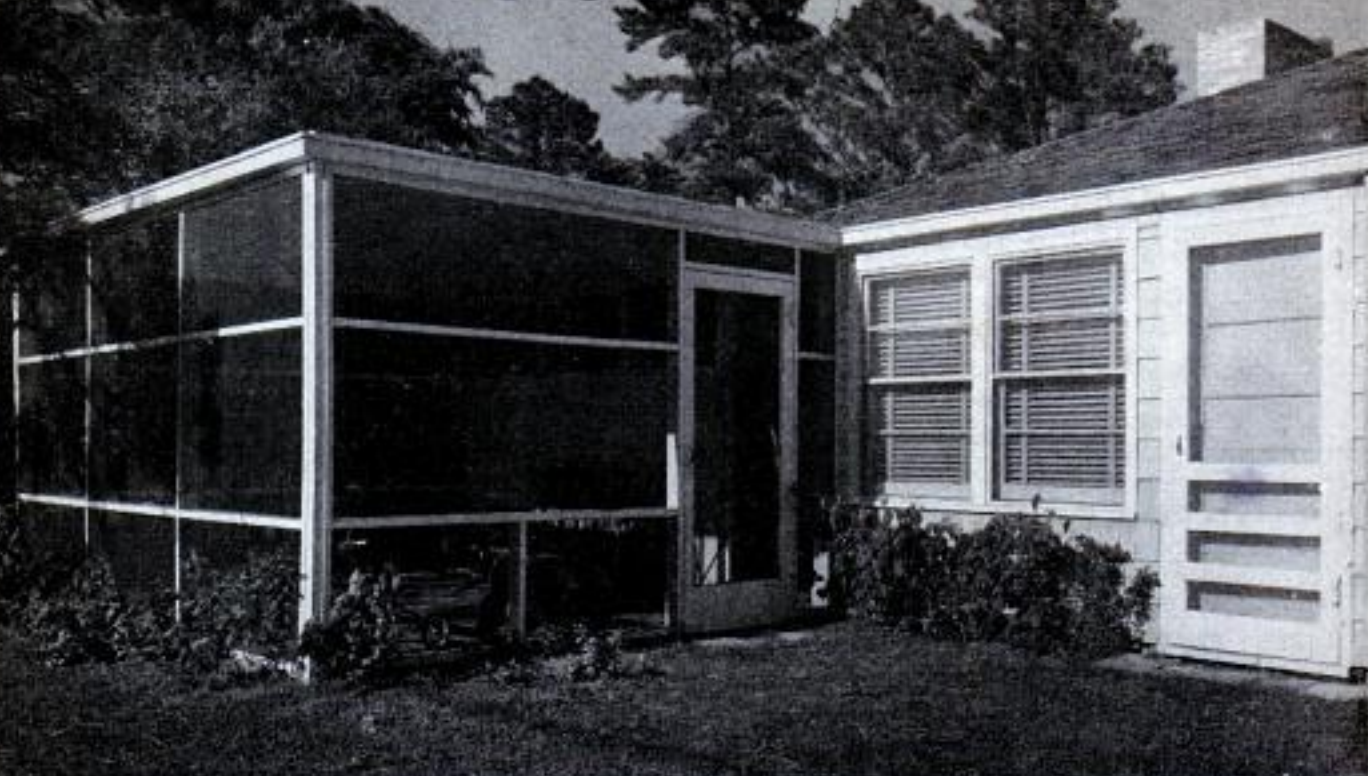


Photo courtesy Popular Home, U. S. Gypsum Co.

PORCHES and BREEZEWAYS ADD LUXURY TO YOUR HOME

By E. R. Haan

BESIDES AFFORDING sheltered passage between garage and house, the addition of a screened breezeway, or porch, to your home provides an outdoor room you'll thoroughly enjoy the whole summer long. Screened from pesky flies and mosquitoes and shaded from the hot sun, a breezeway brings the outdoors indoors to add real luxury to summer living.

Concrete floors: A concrete slab-type

floor, 4 in. thick, can be laid directly on compact, well-drained earth, or raised above grade on a layer of coarse gravel or crushed stone. Forms are required at the edges only as in Fig. 1. The floor should have a drainage pitch of $\frac{1}{4}$ in. per ft., sloping away from the house or toward one side. To prevent possible cracking, it is best to reinforce the floor with 40-lb. welded wire mesh embedded at the center.

Where a concrete-slab floor is to be laid over filled earth which will settle, the

Exterior and interior views show open ranch-house breezeway enclosed for pleasant year 'round living
Hedrich Blessing photos courtesy Andersen Corp.





Photo courtesy Small Homes Guide

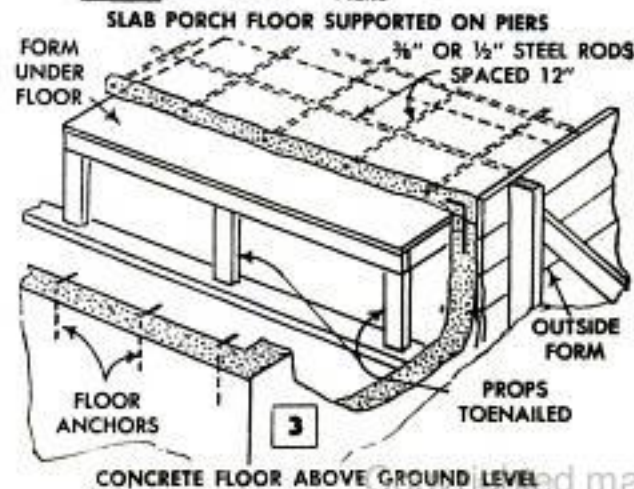
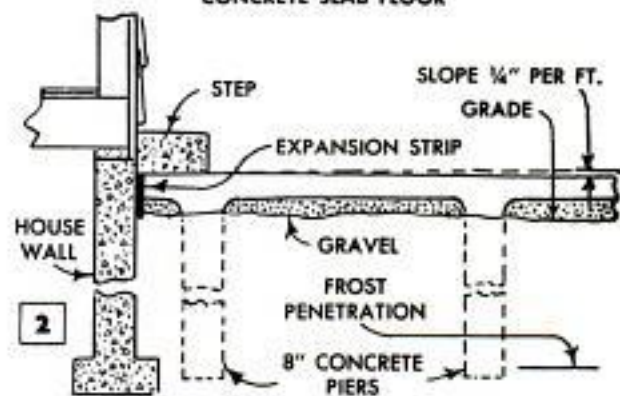
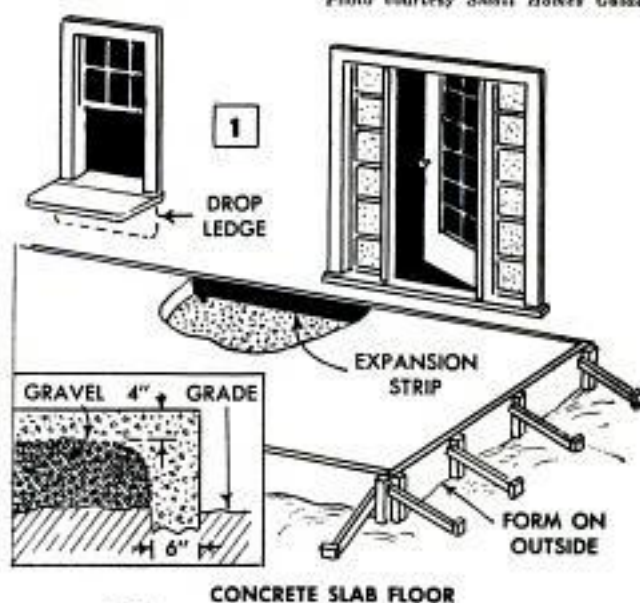
floor should be supported on either piers or foundation walls resting on compact, undisturbed earth as in Fig. 2. You can bore holes for the piers with an 8-in. post-hole auger if the earth is firm. In sandy soil you can use furnace pipe for forms.

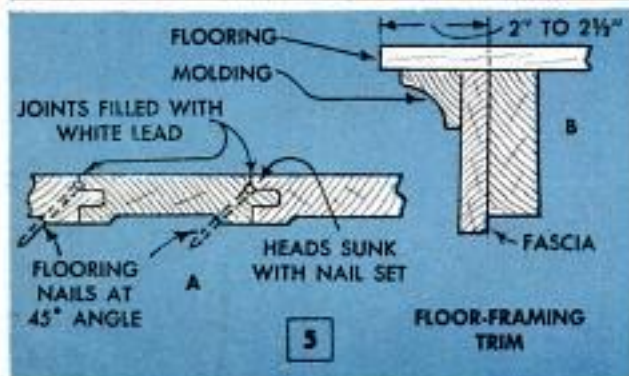
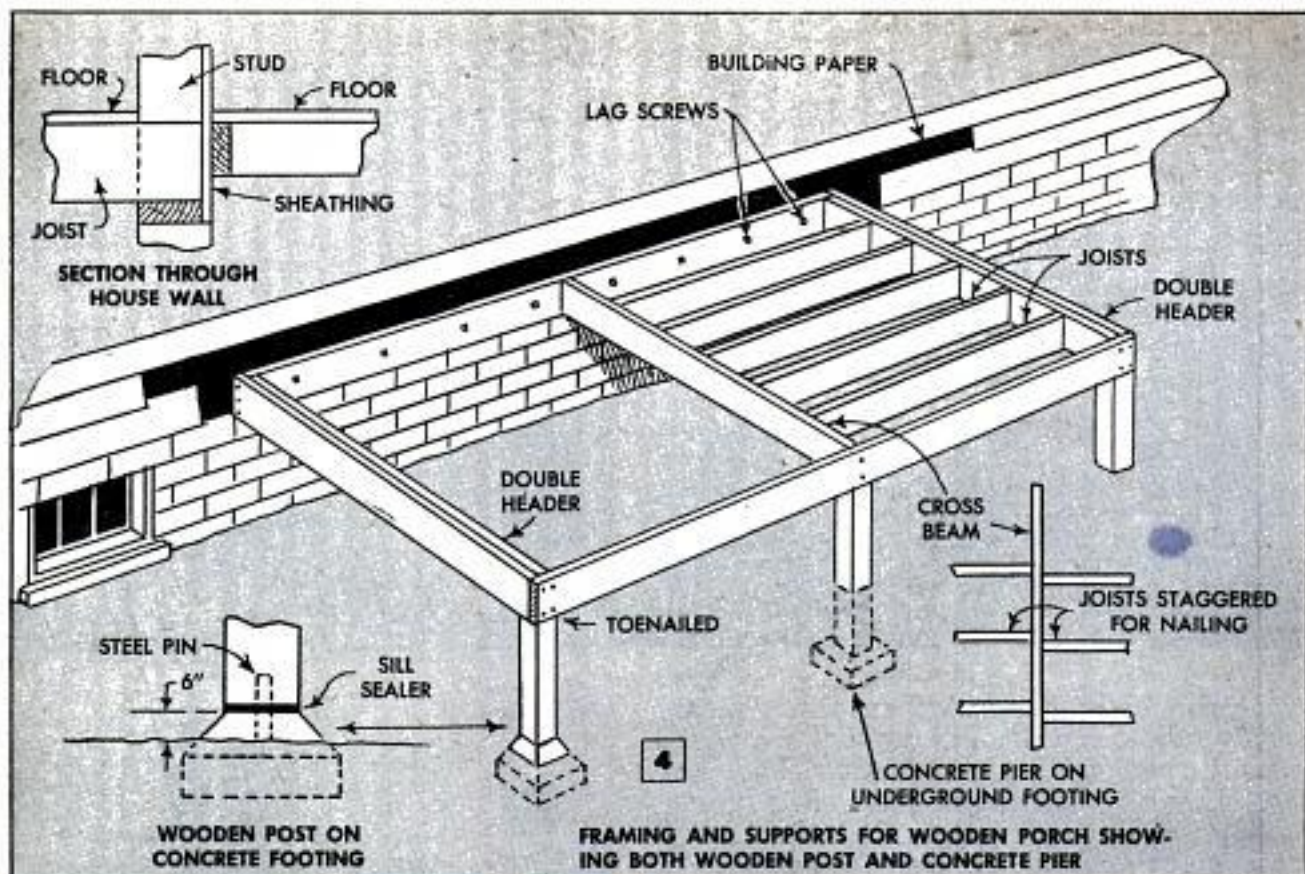
To keep a concrete floor from cracking if a void forms under it due to settling fill, reinforce the floor at the time it is poured with $\frac{3}{8}$ or $\frac{1}{2}$ -in. steel bars. These are embedded at the center of the floor thickness, laying them in both directions, and spaced 12 in. apart. Such reinforcement also is required for a concrete floor that is laid several feet above grade over a crawl space as in Fig. 3. Here the floor is laid on horizontal forms adequately supported, with an opening being left in one wall to permit removing the forms.

In locations subject to heaving frosts, piers or walls should extend slightly beyond the depth of frost penetration. Foundation walls should rest on footings. For the average-size porch not carrying the added weight of a room above it, a wall footing 6 in. thick and 12 in. wide is sufficient. Where a concrete floor is cast against an existing concrete or brick wall, an asphalt-compound expansion strip is inserted at the joint before laying the floor.

When flagstone is used for porch floors, it should be slightly embedded in a 4-in. layer of concrete. Laying flagstone directly on the earth allows the stones to settle unevenly and also encourages ants and burrowing rodents. Flagstone is more rough and difficult to keep clean than concrete.

Foundation for wooden floors: As shown in Fig. 4, the floor framing of a wooden porch may rest on posts, piers or foundation walls. Concrete footings, 6 in. thick and 12 in. square, provide adequate support





for either posts or piers. For medium-size porches where piers are not over 10 ft. apart, the footings should be 18 in. square and 8 in. thick. Large porches where piers are spaced over 10 ft. apart, should have concrete footings 10 or 12 in. thick and 24 in. square. Piers are located at corners and at the outer ends of crossbeams. The roof-

Photo courtesy Small Homes Guide

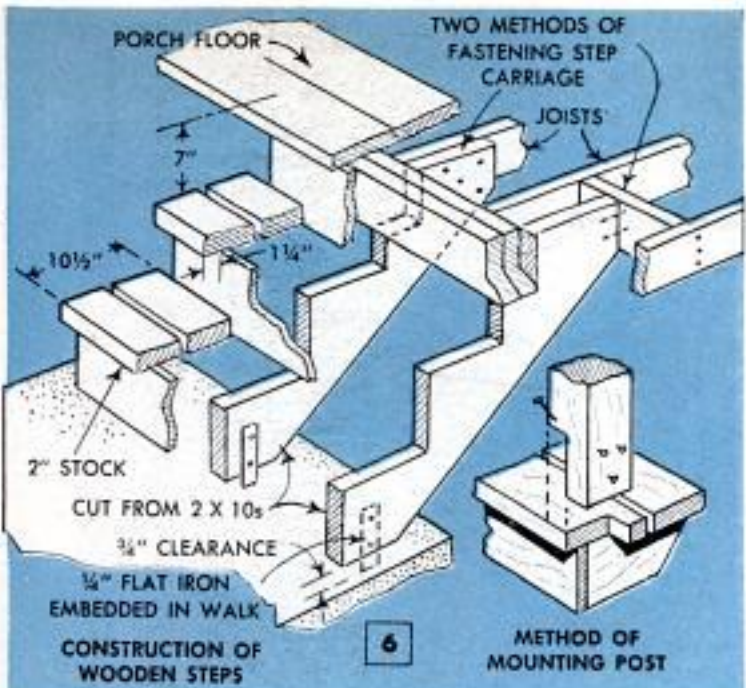


supporting posts of the porch usually are located directly over the piers.

Floor framing: To anchor a wooden porch floor to the house, first remove a section of siding, shingles or stucco, as the case may be, leaving the sheathing intact. This permits nailing or lag-screwing a full length joist to the studs. On brick or stone walls, the joist is attached with lag screws driven into expansion sleeves placed in holes drilled in the mortar.

As porch flooring should be laid in the direction of drainage, joists should run parallel to the house. Greatest rigidity is obtained by using relatively short joist spans between the end headers supported by one or more crossbeams, as in Fig. 4. The headers are nailed to the ends of the joist that is fastened to the house. The beams may be toenailed to this joist or held to it by means of flat-steel stirrups. After the outer framework has been completed, the joists are spaced 16 in. on centers and end-nailed with 16d nails. Note that joists on both sides of the crossbeams are staggered to permit end-nailing. For spans of 8 ft. or less between supports, use 2 x 6 framing members. Two-by-eight stock is recommended for spans from 8 to 12 ft. The floor framework is given a slight slope.

Flooring: Porch flooring generally runs $25/32$ in. thick and flooring cut from heartwood is most resistant to decay. Matched tongue-and-groove flooring is laid across the joists and nailed to each one, preferably with aluminum nails. To keep water out of



Portland Cement Association photo

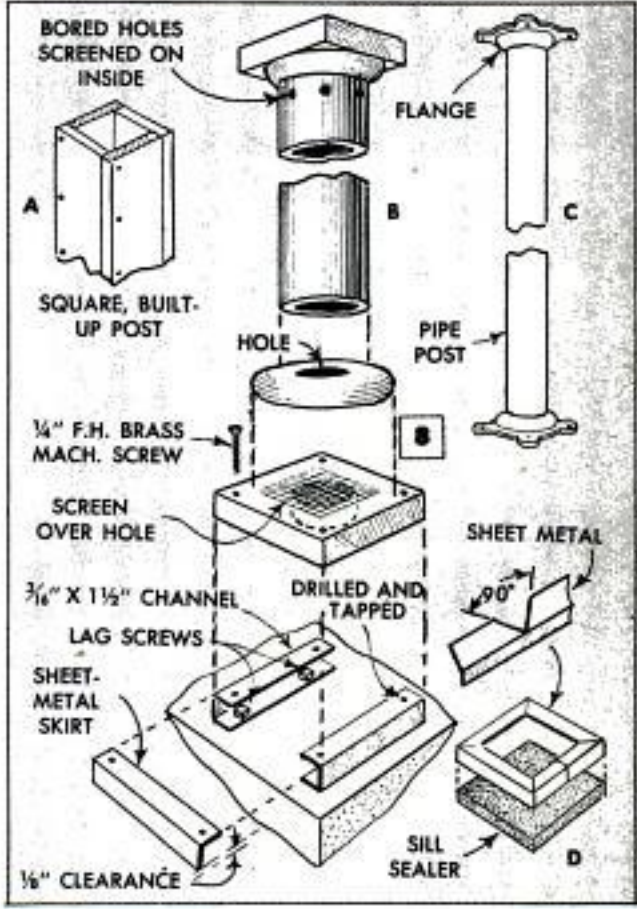
the tongue-and-groove joints, seal them with white lead as each board is laid and force the flooring together tightly before nailing. Drive the nails at a 45-deg. angle at the base of the tongue as in Fig. 5, detail A, and sink the heads with a nail set. Flooring should extend about 2 in. beyond the framework. Let the random ends project beyond this distance, then mark and cut off straight at one time. A fascia board and molding are applied to conceal the framework as in Fig. 5, detail B. The trim is mitered at the corners.

Porch steps: Construction of steps for wooden porches that are several feet above grade is detailed in Fig. 6. The two-piece treads provide good drainage. Fig. 7 shows typical poured-concrete steps fitted with an iron railing.

Roof-supporting posts: Solid wooden posts, 4 to 6 in. square, generally are used to support the roof of a porch or breezeway. Hollow wooden posts may be built up square as in Fig. 8, details A and B. Large-diameter pipe also can be used for posts, detail C.

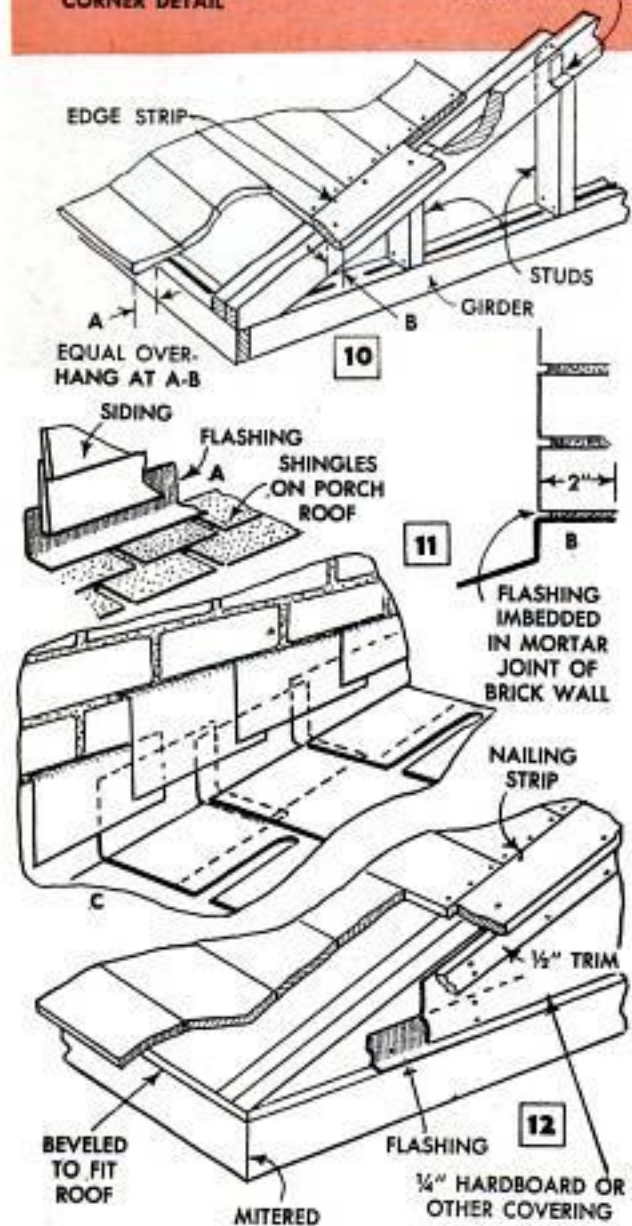
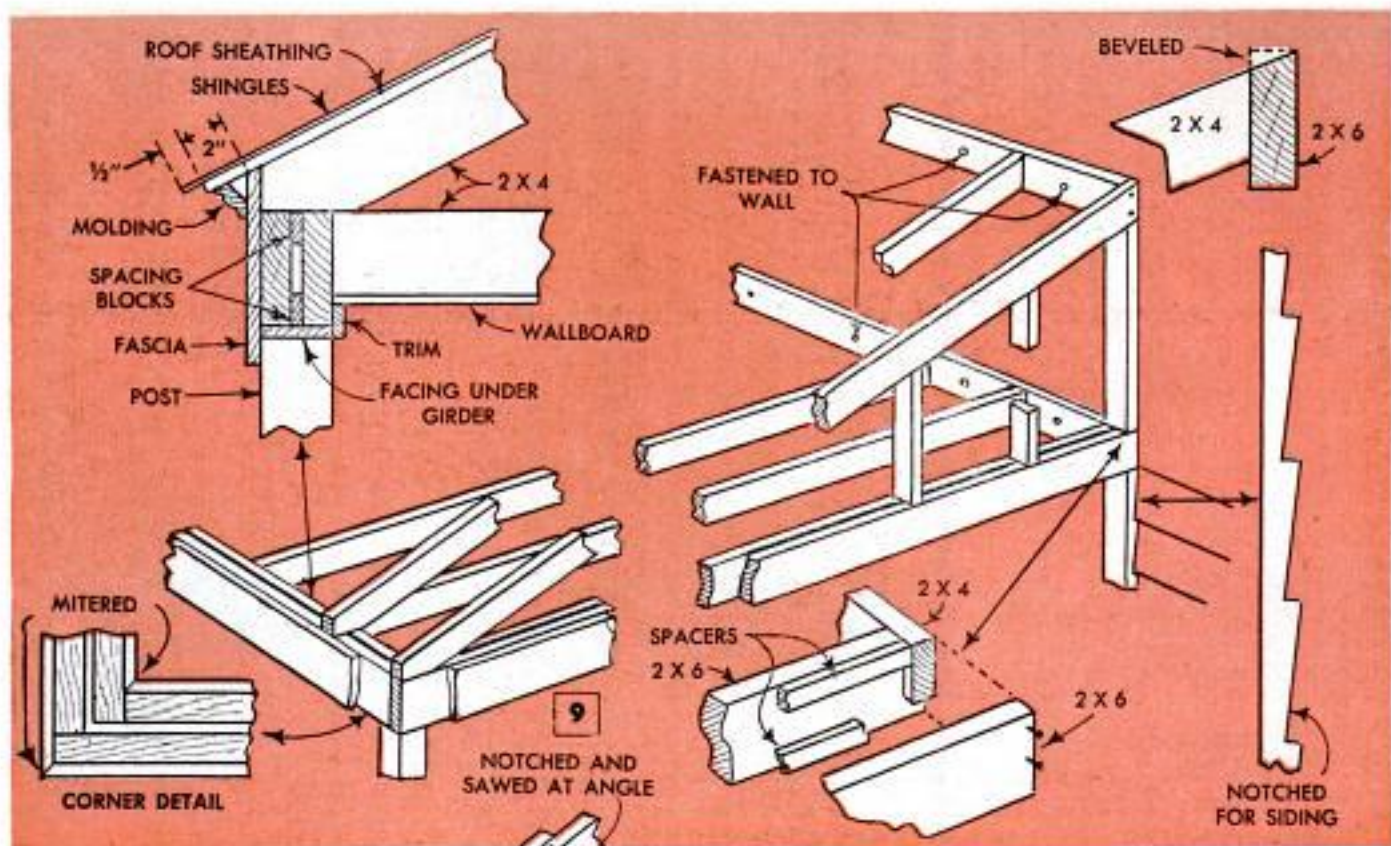
Hollow posts and columns should be ventilated with screen-covered holes at the top and bottom. Also, it is best to elevate the column base on nonrusting metal angles to keep the wood dry and prevent it from rotting. Another way to do this is to mount the post on a 1/2-in. asphalt-compound sill sealer, using sheet metal around it to conceal the sealer, Fig. 8, detail D. The lower end of the post should be treated with wood preservative.

Framework for ceiling and roof: Construction details in Fig. 9 show typical framing for ceiling and roof. A header is attached to the house wall in the same way as the first joist of the floor framework.



Floor-to-ceiling heights should not be less than 7 ft. The girders are temporarily braced while nailing them together and to the header which is fastened to the house. The underside of the outside girders is covered with a facing piece of equal width. Girders for a small porch may consist of two lengths of 2 x 4 stock, but 2 x 6 stock is preferred for a medium-size porch.

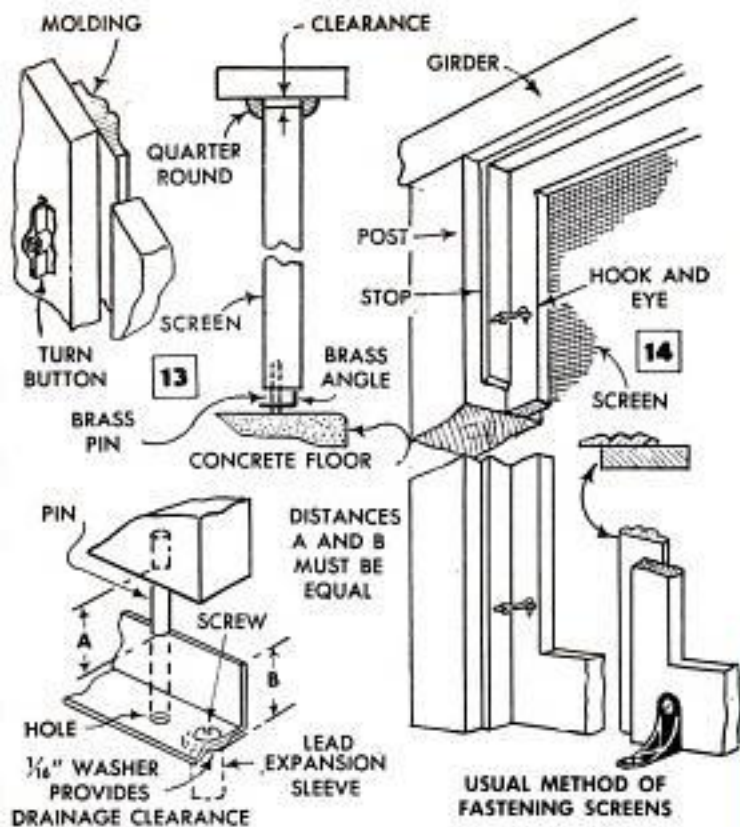
Ceiling joists of 2 x 4s are adequate for spans up to 10 ft. The joists are toenailed to the header and girder, flush with the top edges. This arrangement varies from



general construction where the joists normally rest on plates. Ceiling joists, rafters and studs are spaced 16 in. on centers.

Roofing the porch: A shed-type roof, such as shown in Fig. 9, is easiest of all to build. It consists of a header attached to the house to which the rafters are toenailed. If the rafters extend beyond the girder at the eave, they are notched to fit over it. The end rafters are aligned with the side girders. Roof boards and edge strips are applied to the rafters as in Fig. 10. Start the shingling from the lower edge of the roof and use a double layer for the first course. Let the shingles overhang the roof boards $\frac{1}{2}$ in., and install metal flashing between the porch roof and the house wall as in Fig. 11. Detail A shows flashing under the siding of the wall and over the shingles of a shed-type roof. Detail B shows how flashing is mortared between bricks. Where the porch roof slopes along a brick wall, double flashing is installed as shown in detail C. Open wall sections between side girders and end rafters are enclosed and then trim is applied as in Fig. 12. This illustration shows how hardboard can be used for this purpose. In the construction shown, the fascia closes the opening between the ends of the rafters. In gable and hip-type roofs the rafters next to the house are attached directly to it. An enclosed space between the ceiling and the roof should be vented.

Screen frames: If a porch is to have screens but no sash, use $1\frac{1}{8}$ -in. screen stock for the screen frames. Nonrusting



screen is the most economical because of its durability, although the initial cost may be higher than that of ordinary wire screen. To prevent the lower crossrails of the screen frames from absorbing water on the floor, mount them on nonrusting metal angles as in Fig. 13. The screens are pushed up into channels at the top, then let down on the sills, these being drilled to take pins projecting from the screen frames. Shimming up the sills slightly above the floor with nonrusting washers takes care of drainage. The usual method of attaching screens is shown in Fig. 14. Fig. 15 shows a typical porch screened in this manner. To use a porch the year 'round, it must be fitted with permanent windows or stock combination screen-and-storm doors set edge to edge. In the case of stock sash, the walls are framed as in Fig. 16.

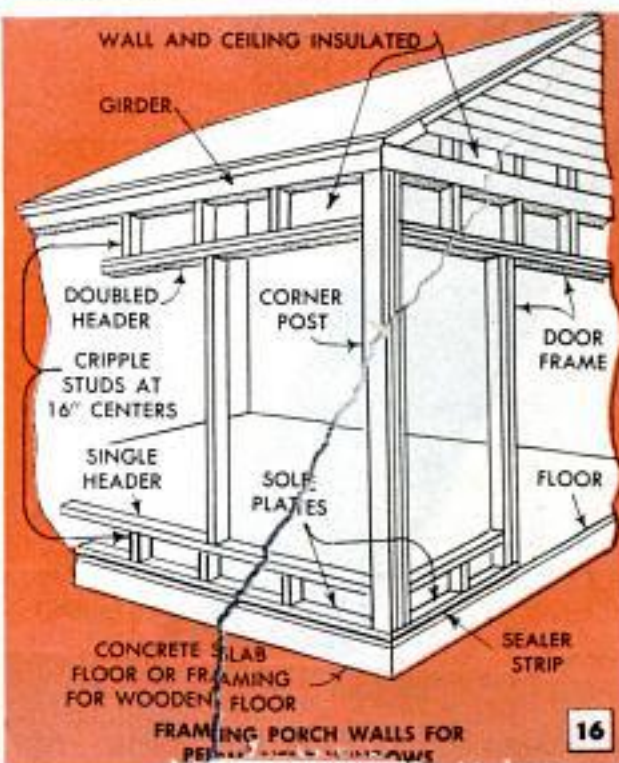


Photo courtesy Ray-O-Lite Corp.

ATLANTA 6, GA.



Garden Hose Fitted on Coaster Wagon Provides Shin Protector

SPLIT HOSE SECTION



A length of rubber garden hose will help prevent the bruised shin which small boys acquire when propelling a coaster wagon with one leg. The hose is slit and slipped over the back edge of the wagon box. A coat of gasket shellac applied to the wagon will aid in keeping the hose in place.

G. E. Hendrickson, Argyle, Wis.

Shoe Box Holds Knobs for Painting

The hand-painting of small drawer knobs can be done easily if the knobs are first mounted on the bottom of an inverted cardboard box, such as a shoe box. The screws are pressed through the box and threaded into the knobs so the latter can be rotated when painting. The painted knobs can be left on the box until they have dried.

Howard E. Moody, Upper Jay, N. Y.

Short Comparative Measurements Made With Paper Clamp and Rule



Fastened at a predetermined point on a ruler a paper clamp will provide a means of making quick comparative measurements, such as are required when sorting bolts, pipe nipples, etc., that need to be the same length. The clamp also can be used as a stop when marking a number of pieces that must be cut exactly the same length.

Insulation Maintains Uniform Temperature in Solution

The use of insulation will overcome the problem of maintaining a uniform temperature in developing solutions, which is especially difficult during extremely hot or cold weather. An empty 1-lb. coffee can is placed in a sauce pan and loose insulation is filled in around it. The coffee can is just the right size to hold a regular plastic roll-developing tank.

No Hotel Worries

on your vacation this summer. Stop when you wish and be asleep within minutes in a car bed described next month. It sleeps two comfortably and fits almost any car—and will make your vacation dollars stretch farther than they do now

Vessels Supported Over Burner By Wire Lamp-Shade Frame

Flat-bottomed vessels to be heated over a Bunsen burner may be supported by the wire frame of a discarded lamp shade. Strip the covering from the frame, fasten a piece of wire mesh over the top and position the burner under the center. The lamp shade should support the wire mesh about 1 in. above the flame.

Frank Shore, New York City.



POPULAR MECHANICS

THE MANUAL-SHIFT TRANSMISSION— How It Works

ALTHOUGH clutch-and-manual-shift transmission assemblies of modern cars are relatively trouble-free, a knowledge of how the two units work is helpful to every motorist in driving and maintaining his car. To provide maximum power at low speed, the transmission permits the engine to turn at a high speed in relation to the movement of the rear wheels. At driving speed, less power is needed, and the transmission provides a means of maintaining road speed at lower engine speed.

A friction clutch, used between the engine and the transmission, permits uncoupling the engine when it is necessary to change gear ratios. Also, the clutch slips just enough to permit the transmission to be brought gradually up to engine speed. A cross section of a representative clutch, in the released position, is shown in Fig. 1. The clutch plate is a steel disk with a friction facing on both sides. It is splined to the transmission shaft and, when the clutch is depressed, turns independently of the engine. Heavy springs in the pressure plate, which is bolted to the flywheel, exert a constant pressure to force the clutch plate against the flywheel. When the

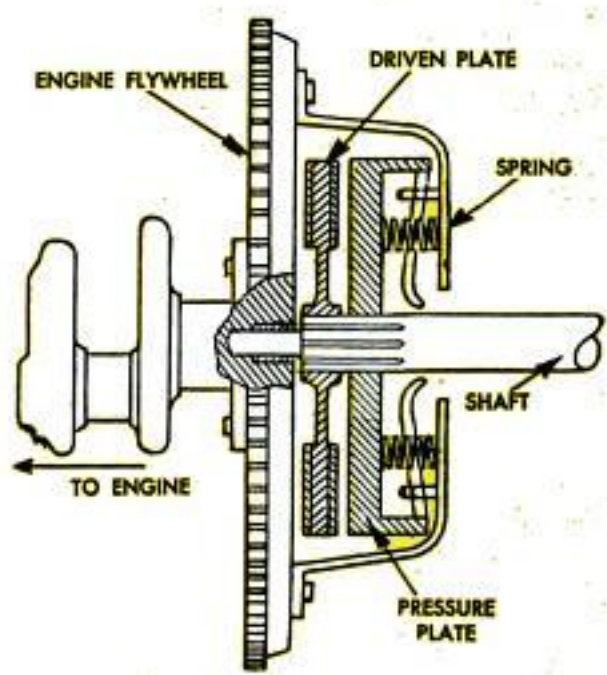
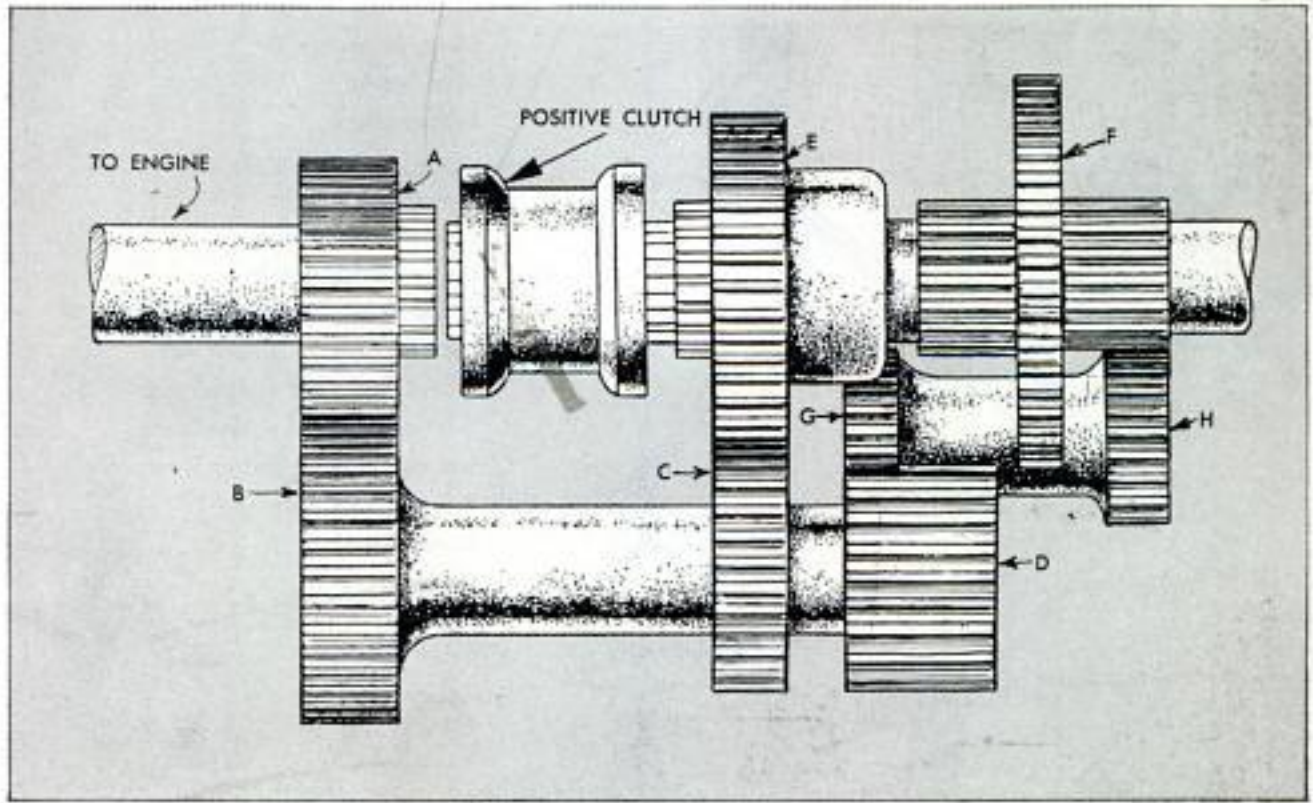


Fig. 1. Cross section of a representative friction clutch used with a manual-shift transmission, shown in the released position. The driven plate has a friction facing on both sides and slides on the splined shaft. When the clutch is engaged, the springs in the pressure plate force it against the flywheel

Fig. 2. Drawing of a typical constant-mesh transmission as seen from above. Gear A is fastened solidly to the transmission shaft, the front end of which is splined to receive the clutch plate



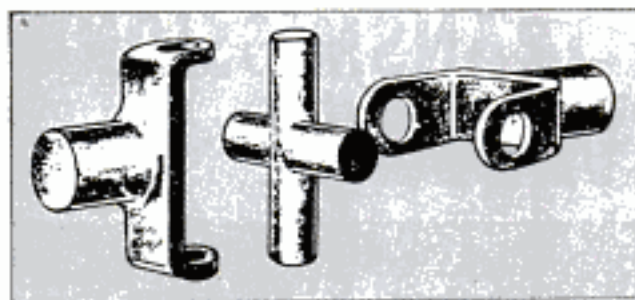


Fig. 3. Typical universal joint used on drive shaft. Actual assembly uses four sets of needle bearings

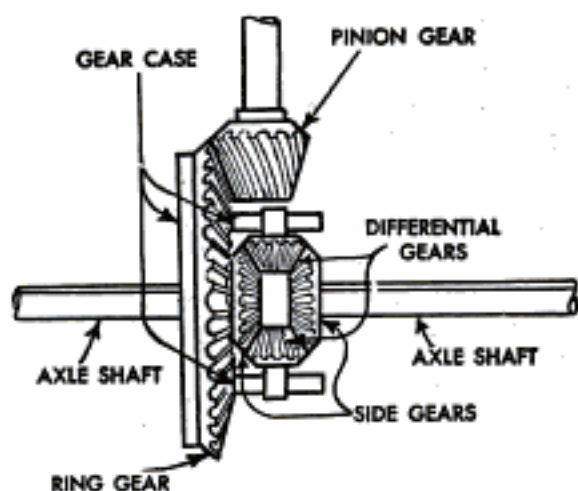
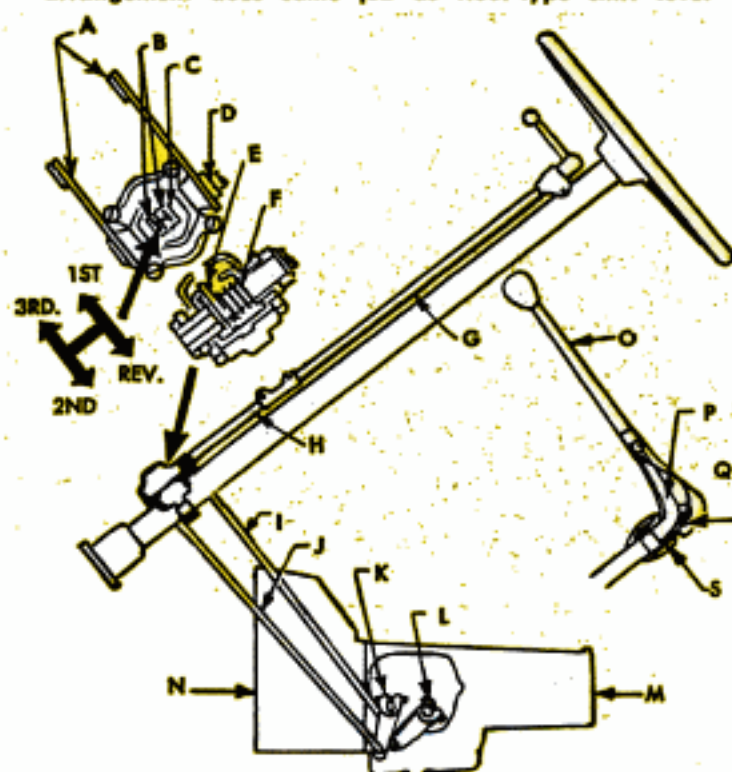


Fig. 4. Representative differential. The pinion gear turns the ring gear. It is bolted to the free-turning gear case which also carries the differential gears

clutch is fully engaged, the springs lock the clutch and flywheel together as a unit.

A typical, constant-mesh transmission, is shown in Fig. 2. Gear A is fastened solidly to the transmission shaft, the forward end of which is splined to receive the clutch plate. Gears B, C and D are fastened to the countershaft in the transmission. Gears A and B are in constant mesh, so that whenever the engine is running and the clutch is engaged the countershaft is turning. Gears E and F are on the transmission main shaft, which is coupled to the drive shaft. Gear E is in constant mesh with gear C, but rotates independently of the main shaft except when held by the positive clutch. Gear F is splined to the main shaft, and is free to slide. The reverse idler is a short shaft on which are fastened gears G and H. Gear G is in constant mesh with gear D. Even in neutral, as shown in the drawing, the countershaft gears, gear E and the reverse-idler gears, are being rotated by gear A. The main shaft does not turn. But if gear F slides forward, it meshes with D, which is low gear. If it slides back, it meshes with H, putting the transmission in reverse. When the positive clutch slides back, it locks E to the transmission main shaft, producing second gear. When it slides forward, it locks the main and clutch shafts, producing direct drive, or high gear. All shifts are made by moving only two parts, the slid-

Fig. 5. Shift lever and linkage from driver's compartment down to transmission. Although more complex, this arrangement does same job as floor-type shift lever



SHIFT LEVER AND LINKAGE

- A. Outer levers
- B. Inner levers
- C. Shifter gates
- D. Lower control shaft
- E. Control-shaft lever
- F. Control-shaft spring
- G. Upper control shaft
- H. Lower control shaft
- I. First and reverse control rod
- J. Second and third control rod
- K. Second and third shifter lever
- L. First and reverse shifter lever
- M. Transmission case
- N. Clutch housing
- O. Gearshift lever
- P. Upper control shaft
- R. Axial pivot
- S. Rotary swivel

ing gear F and the positive clutch. These are moved by the shifting forks (Nos. 38 and 39 in Fig. 6) which are connected to the gearshift lever through the linkage shown in Fig. 5.

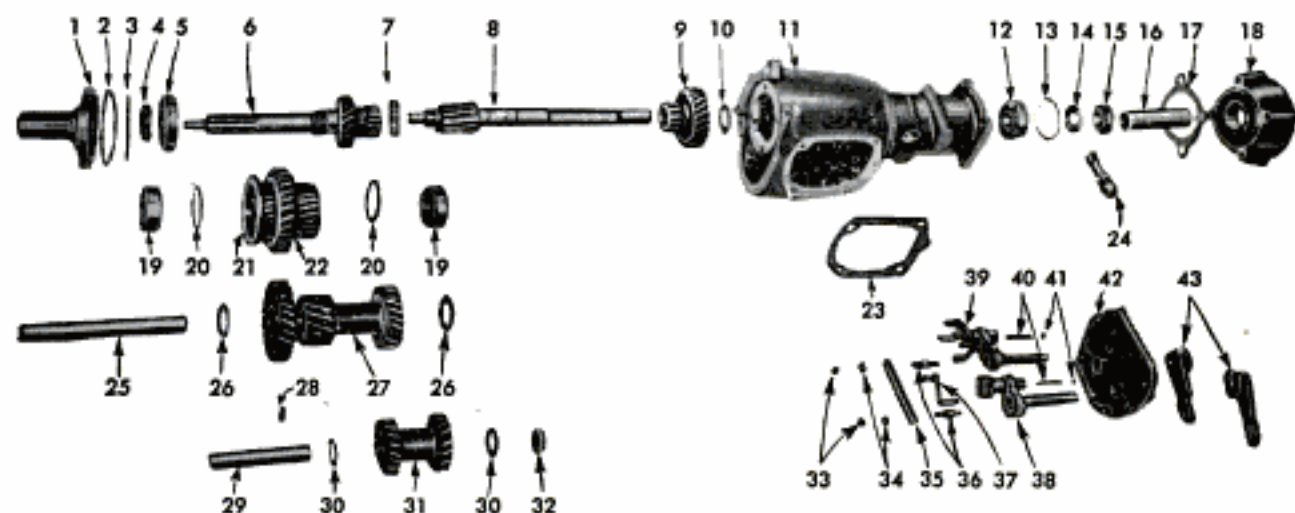
A modern, constant-mesh transmission, as shown in the exploded drawing, Fig. 6, uses one of various types of synchromesh positive clutches to produce smoother shifting.

A drive shaft, or torque tube, depending on the model of car, leads back from the transmission to the differential. It is fitted with one or more universal joints, Fig. 3, to compensate for the motion of the rear axle. The drive shaft turns the pinion gear

in the differential, Fig. 4, which turns the ring gear to provide a right-angle change in the direction of the power drive.

The ring gear is bolted to the differential gear case, which revolves inside the differential housing. The differential gears, being turned by the gear case, transmit power to the side gears which are on the axles. In a straight-line drive, the differential turns as a unit, with both axles at the same speed. However, if one wheel slows down, as when the car is turning a corner, the differential gears turning on their own shafts, are speeded up, and the extra motion is transmitted to the faster wheel, thus preventing it from sliding. ★ ★ ★

Fig. 6. Exploded view of modern constant-mesh manually shifted transmission. Table below names each part



LAYOUT OF TRANSMISSION PARTS

- | | |
|--|---|
| 1. Clutch-gear bearing retainer | 23. Gasket for transmission cover |
| 2. Clutch-gear bearing-retainer gasket | 24. Speedometer-driven gear |
| 3. Clutch-gear bearing snap ring | 25. Countershaft |
| 4. Bearing nut and oil slinger for clutch gear | 26. Thrust washer for counter gear |
| 5. Clutch-gear bearing | 27. Counter-gear assembly |
| 6. Clutch gear and shaft assembly | 28. Lock pin for reverse-idler shaft |
| 7. Main-shaft pilot needle bearings | 29. Reverse-idler shaft |
| 8. Main shaft | 30. Thrust washer for reverse-idler gear |
| 9. Second-speed gear | 31. Reverse-idler gear |
| 10. Thrust washer for second-speed gear | 32. Expansion plug |
| 11. Transmission case | 33. Stud nut for shifter-interlock retainer |
| 12. Rear bearing for main shaft | 34. Lock for stud nut of shifter-interlock retainer |
| 13. Snap ring for rear bearing of main shaft | 35. Shifter-interlock retainer |
| 14. Spacer for speedometer-drive gear | 36. Stud for shifter-interlock retainer |
| 15. Speedometer-drive gear | 37. Shifter-interlock shaft |
| 16. Spacer for universal joint | 38. Second and third shifter fork |
| 17. Gasket for rear-bearing support | 39. First and reverse shifter fork |
| 18. Rear-bearing support | 40. Detent spring for shifter fork |
| 19. Synchronizer ring | 41. Detent ball for shifter fork |
| 20. Snap ring for synchronizer ring | 42. Transmission cover |
| 21. Synchronizer drum | 43. Shifter-shaft levers |
| 22. First and reverse gear | |

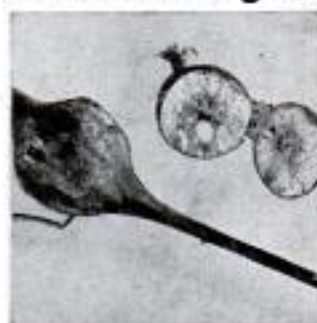
Novel Book Ends for Shop Volumes Feature Divided C-Clamp



A novel and appropriate device for holding your shop reference books may be made from scraps of wood and a C-clamp cut in half. First make the book ends as described in the detail, adding a piece of felt glued to the bottom of each to protect your desk or shelf. Next hacksaw the frame of the C-clamp in half. Each half then is fastened to one of the ends with cement or wood putty. A light, inexpensive clamp may be used, since it is only decoration.

Ralph S. Wilkes, Keuka Park, N. Y.

Grubs Found in Goldenrod Galls Provide Bluegill Fish Bait



Grubs that are found in goldenrod galls provide excellent bait for bluegill fishing through the ice in winter. What's more, they can be gathered from fields throughout the winter months.

Only galls that do not have holes in the sides should be selected, since holes will indicate that the grubs have left. To open a gall, cut in part way with a sharp knife and then twist the blade sharply.

Clyde Allison, Cadillac, Mich.

Shelf-Support Stripping Forms Adjustable Support for Light

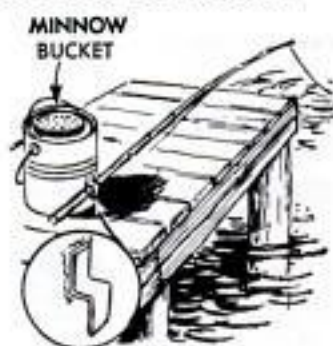


To make a fully adjustable wall support for a floodlight, use a length of metal shelf-support stripping, obtainable at your hardware store. One of the small shelf brackets supplied with the strip replaces the clamp of the swivel holder attached to the floodlight socket. This allows

the light to be hung at any height desired with one quick adjustment. Another of the small brackets takes up the slack of the light cord.

Fishing Pole Anchored to Bucket

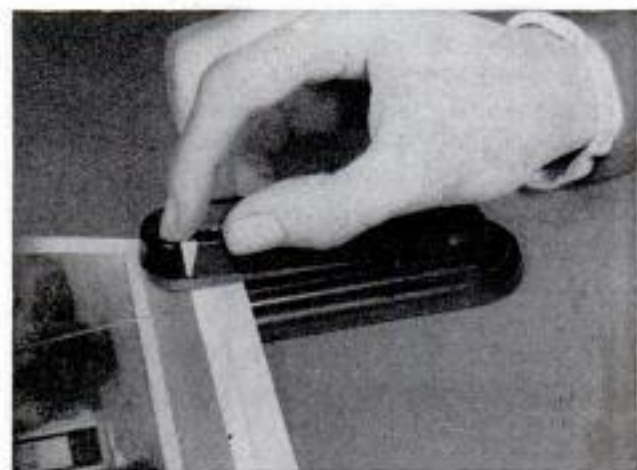
If you solder a metal bracket of the type shown to your minnow bucket, your fishing pole can be anchored to the bucket, thereby eliminating the necessity of sticking the pole in a mud bank or weighting it with rocks. The bracket is cut from a tin can or from a scrap of sheet metal. If desired, one can be soldered to each side of the bucket.



Point at Which Staple Is Driven Marked by Pointer

To indicate the exact point at which a stapler drives the staple, use a tape marker as shown in the photo. The marker is a wedge-shaped piece of adhesive tape, and its position is located by driving a staple through a piece of paper and then sliding the paper slightly sideways, until the staple comes in view. The tape then is stuck on the arm of the stapler directly above the staple. The mark also could be painted on the stapler arm.

Richard Hanscom, Elmhurst, Ill.

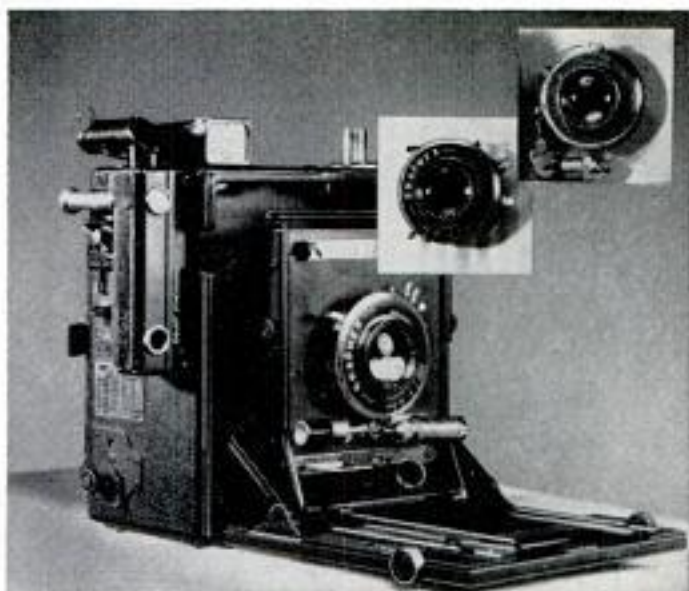


RANGE FINDER SERVES SEVERAL LENSES

By Frank P. Fritz

WHEN THE REGULAR lens of a press-type camera is replaced with one of longer focal length, it generally means that the ground glass must be used instead of the range finder to check the focal point of the new lens at all distances. To overcome this problem, I added a separate footage scale to my camera for each different lens used. First, I placed the new lens in the camera and focused to infinity by sighting at a target 500 ft. distant. Then I temporarily fastened a new blank footage scale to both the rack and bed of the camera and scribed a mark across both. Next I focused on an object accurately measured to be 100 ft. distant and scribed a mark on the bed scale to coincide with the index mark made on the rack scale. I repeated this step for 50-ft., 30-ft., 15-ft., 8-ft. and 6-ft. distances, marking and numbering each distance on the new rack scale.

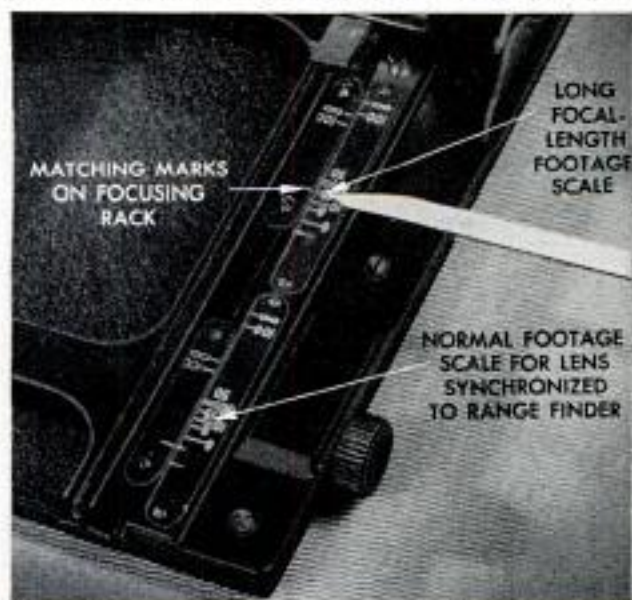
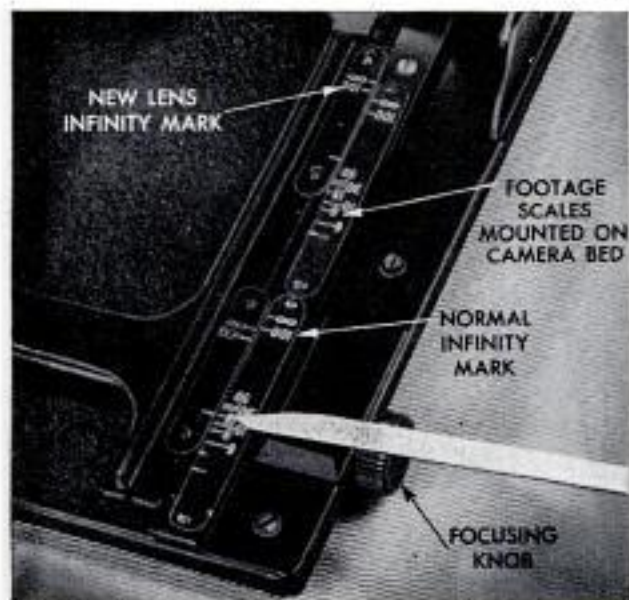
To use this new focal-length lens, I set the rack to infinity, pull out the lens to the rack stop and lock it. Then I unlock the rack and use the range finder in the normal manner, noting the footage on the scale of the normal lens, and rack out the lens to the same distance on the new scale. This brings the new lens into focus.

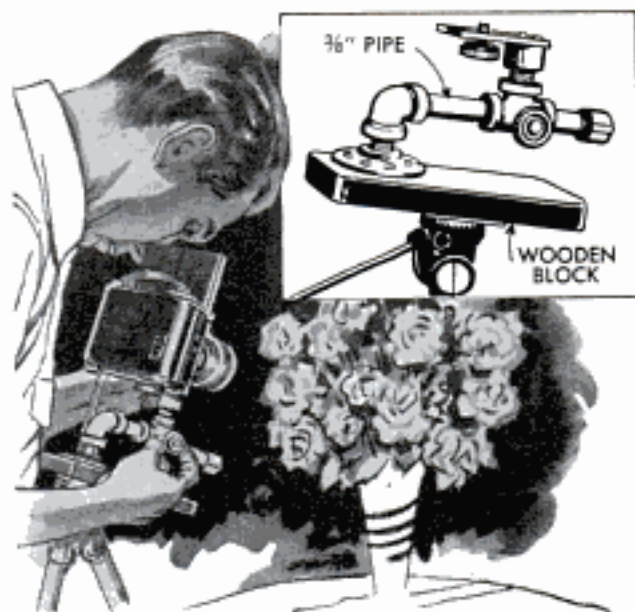


Above, the synchronized range finder on a press camera will serve more than one lens by adding an additional footage scale for each lens used. Below, the original lens is removed and replaced with one of longer focal length



Below, left, without disturbing the locked positions, use the range finder in the normal manner and note the footage scale. Then rack out the lens and set this footage on the scale for the lens of longer focal length as below





Focusing Head for Tripod Made From Pipe Fittings

With this auxiliary tripod head you can make extreme close-up shots without the bother of shifting the camera tripod back and forth. A special fixture clamps the camera to a horizontal arm which allows the camera, rather than the tripod, to be moved the slight amount generally required. The auxiliary head is made primarily of common pipe fittings attached to a wooden base. The base is held to the tripod by turning a tripod socket into a hole in the underside. A $\frac{3}{8}$ -in. pipe flange is

screwed to the top of the base to hold a $\frac{3}{8}$ -in. pipe and fittings which form the support arm. A $\frac{1}{2}$ -in. pipe tee is drilled and tapped to receive a thumbscrew which locks it on the arm. A close nipple is screwed into the tee and fitted with a pipe cap which is drilled and tapped for two small machine screws which hold a short length of flat steel. The steel flat is drilled to receive a tripod bolt which holds the camera. The support arm in the original was made from a 6-in. nipple, which allows about 4 in. maximum forward and backward camera adjustment.—George Carlson, Chicago.

Flash-Bulb Failure Prevented By Cleaning With Suede Brush

Failure of a photoflash bulb at a critical moment, often caused by an oxidized solder contact on the base of the bulb making a poor contact can be prevented by using a suede brush to clean the contact. Suede brushes have brass bristles and will brighten the lead contact to assure a clean connection without damaging the metal.



H. J. Kennard, Gonzales, Tex.

Popular Mechanics New Do-It-Yourself Series



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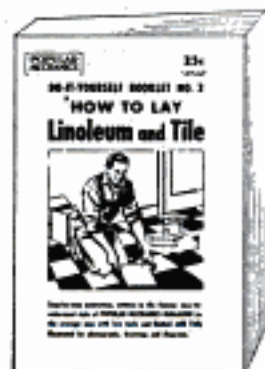
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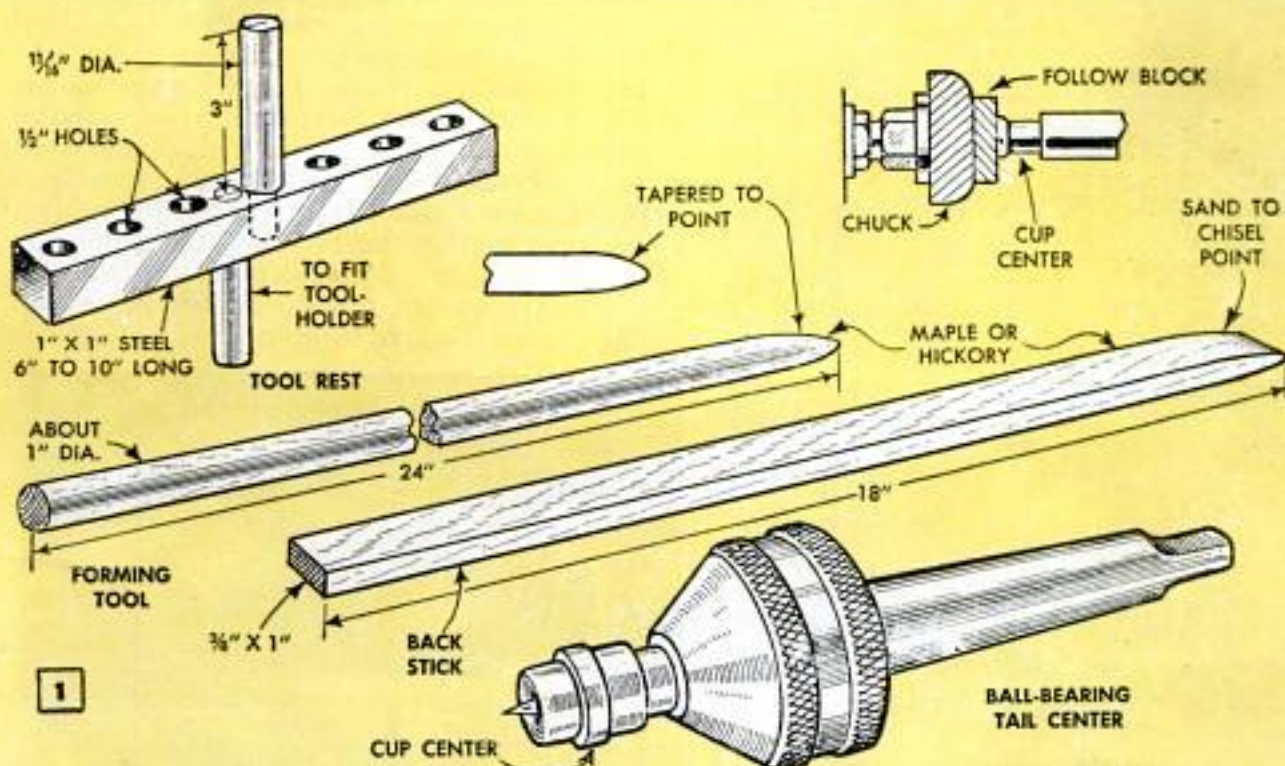


TRY YOUR HAND AT METAL SPINNING

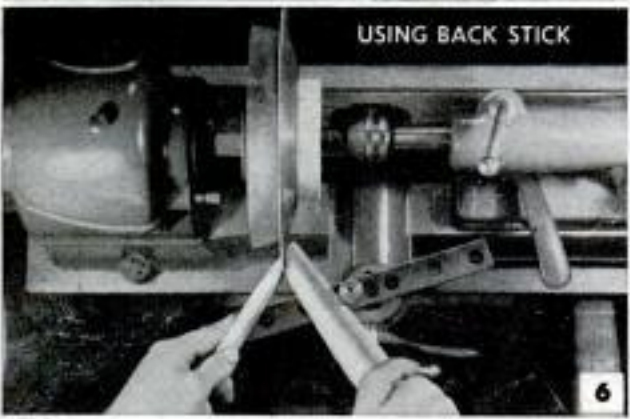
By Sam Brown

IF YOU BEGIN with soft aluminum and work it over a simple form you can spin a bowl in less than five minutes after the job is set up. Aluminum spins very easily and does not tend to score or buckle under the forming tools. It need not be annealed during ordinary spinning procedure as it will take medium-radius bends. It stretches to form tapers without cracking, and offers no undue resistance to flaring, beading and hemming. Pewter has similar characteristics but is rather expensive. For average work pewter is the easiest of all metals to spin. Copper and brass have much higher resistance to spinning and require frequent annealing.

Equipment: For spinning simple projects in aluminum and soft copper, all the special equipment needed is shown in Fig. 1. Wooden forming tools generally are used on these metals. For more advanced work you would need a complete set of special spinning tools, but these are not necessary for the projects detailed. In addition to the

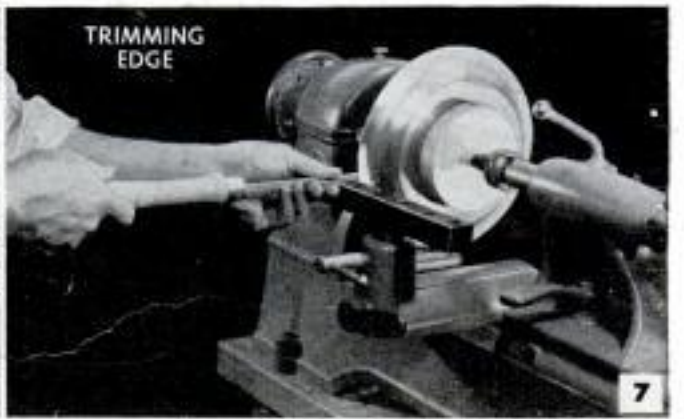


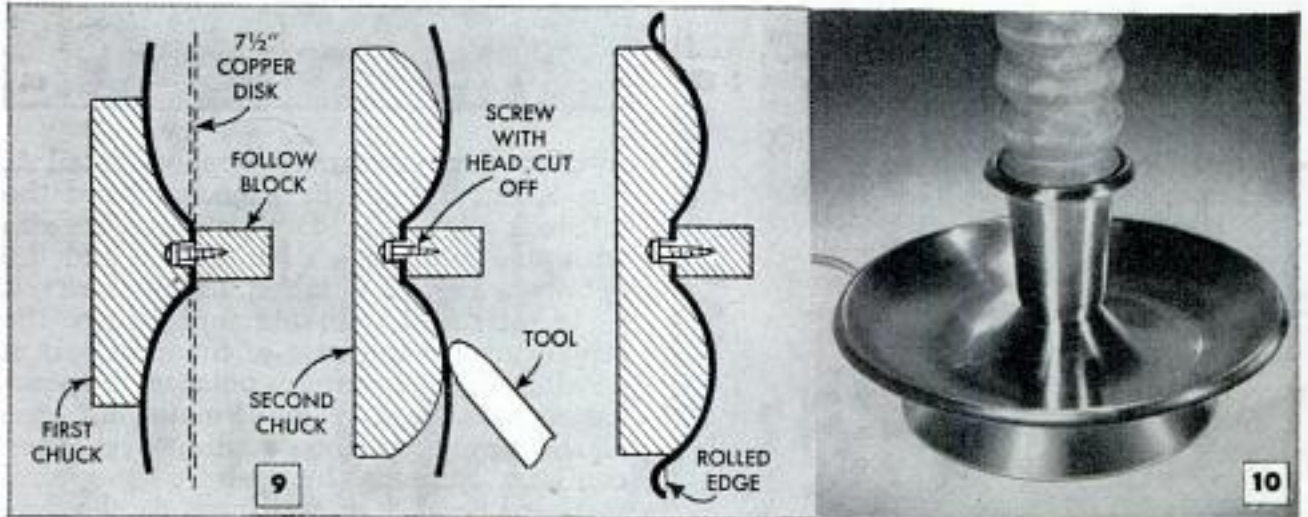
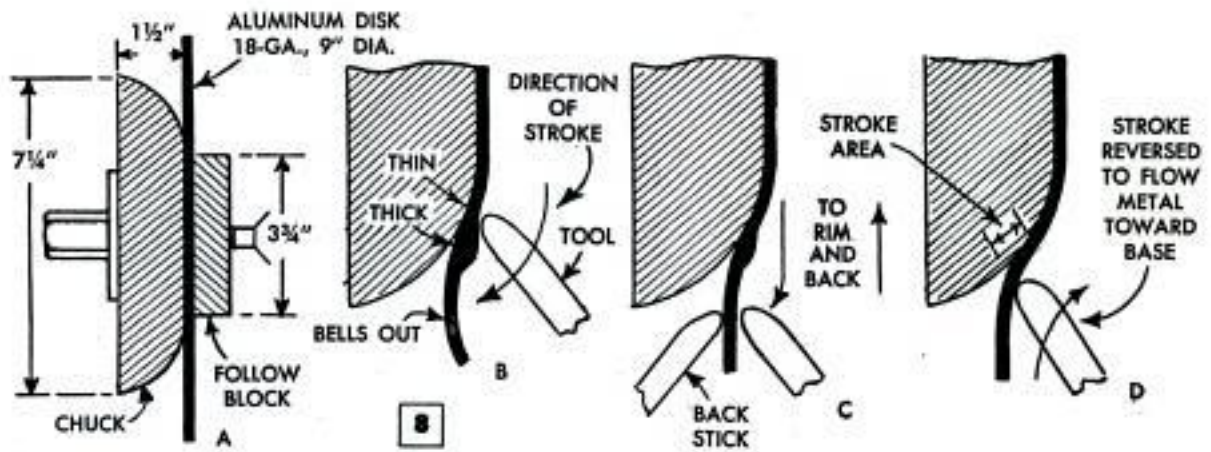
METALS	THICKNESS	ANNEAL	LUBRICANT	REMARKS
Aluminum	16 to 22-gauge. 18-ga. suitable for most work	650°—just chars pine shavings. Water or air cool	Any kind of lubricant can be used: BEESWAX BURNISHING SOAP TALLOW TALLOW CANDLE CUP GREASE LAUNDRY SOAP ☆	Low cost. Easy to spin. Annealing not needed for average work. Use ALCOA 25-O or equal (pure, soft aluminum)
Pewter	14 to 20-gauge. 18-gauge is most popular	No annealing required		Easiest metal to spin, machine and solder. Costs several times as much as aluminum—too much to be practical
Copper	20 to 26-gauge. 23-ga. suitable for most work	1000°—black-red. Quench in water or air cool		Rich golden-red color often desirable. Resists spinning, hence thinner metal specified. Requires frequent annealing
Brass	Same as copper	Same as copper, except air cooling may be preferable	A dry lubricant, such as beeswax, is recom- mended	In general, same as copper, with in- creased tendency to crack and buckle. Requires very frequent annealing



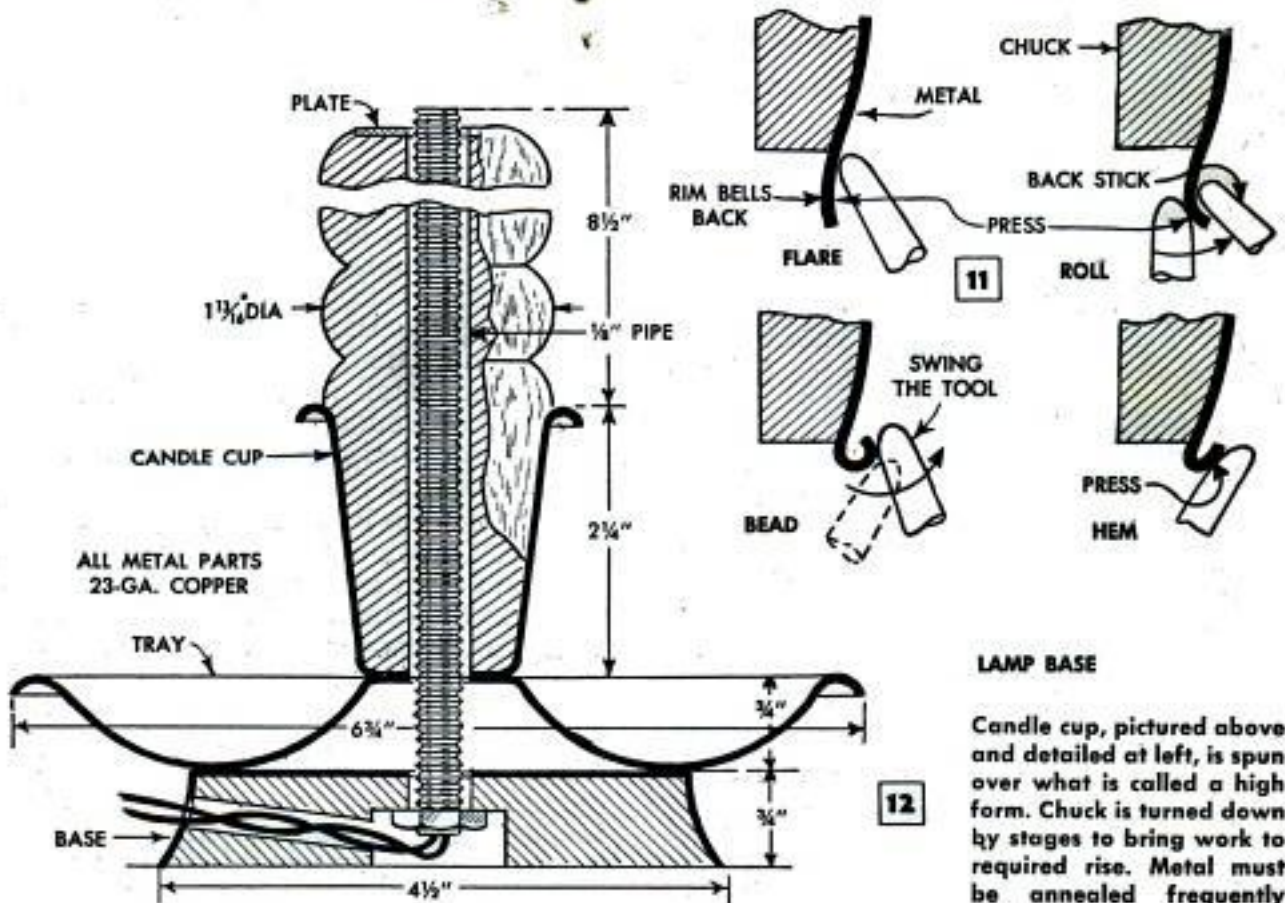
items shown you will need beeswax for lubricating the metal and glazing the hardwood chuck over which the metal is formed. Lathe headstock bearings should be in good condition as they must take fairly heavy thrust. If you plan several projects it will pay to purchase the ball-bearing tail center, Fig. 1. The ball-bearing center turns with the work and does not require frequent lubrication to prevent heating as does the nonrotating cup center. However, the latter can be used for occasional jobs. The special tool rest can be purchased ready to use or one can be made to fit your lathe as in Fig. 1. Also, you require the hardwood chuck turned to the form of the finished project. The chuck must be turned and sanded smooth and glazed with beeswax while in the lathe.

How spinning is done: Figs. 4 to 7 inclusive show how to set up and spin the popcorn bowl pictured in Fig. 3. Projects such as the bowl usually are referred to as low-form types and require no reverse chucking. After the metal disk has been cut to the required size it is centered between the chuck and the follower as in Fig. 4. Adjust the lathe to give a spindle speed of about 900 r.p.m. This speed can be used for nearly all average spinning projects on a small lathe. Begin by applying pressure at the base of the chuck as in Fig. 5, keeping the point of the tool in a small area not more than 1/2 in. wide. Aluminum begins to spin over the form



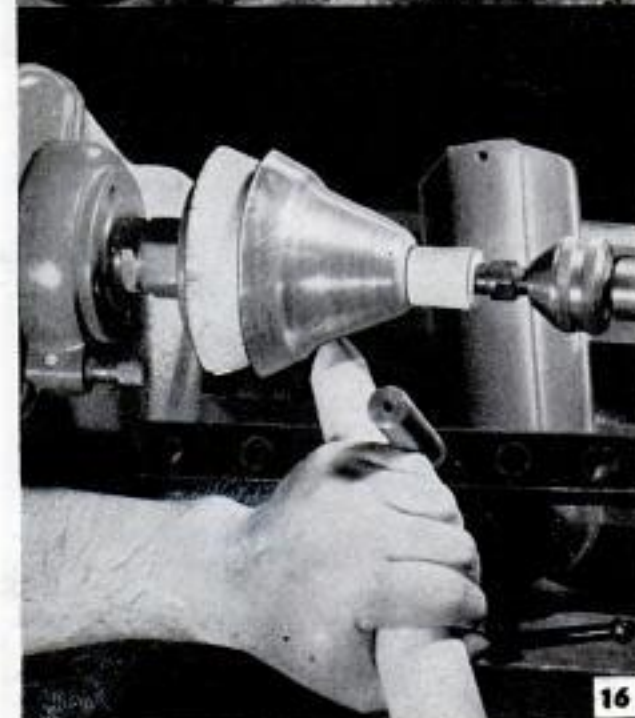
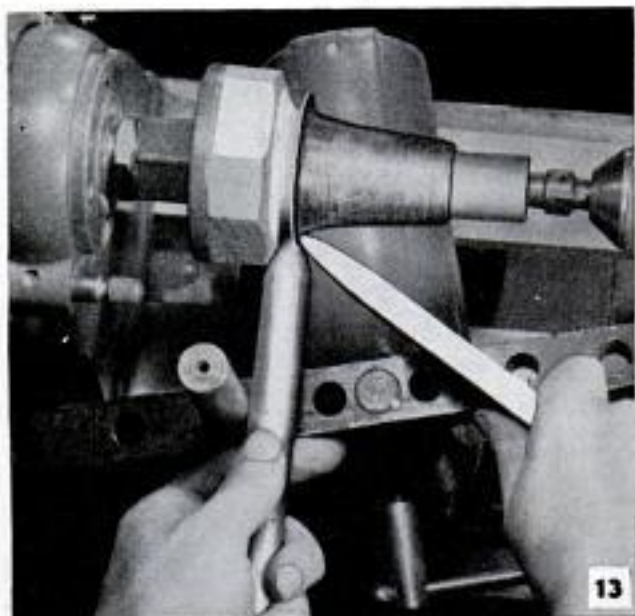


Lamp base in spun copper offers a good example of reverse chucking. Shape requires the use of a first and second chuck. Job is finished with a rolled edge or a bead as shown below. Roll is easiest



LAMP BASE

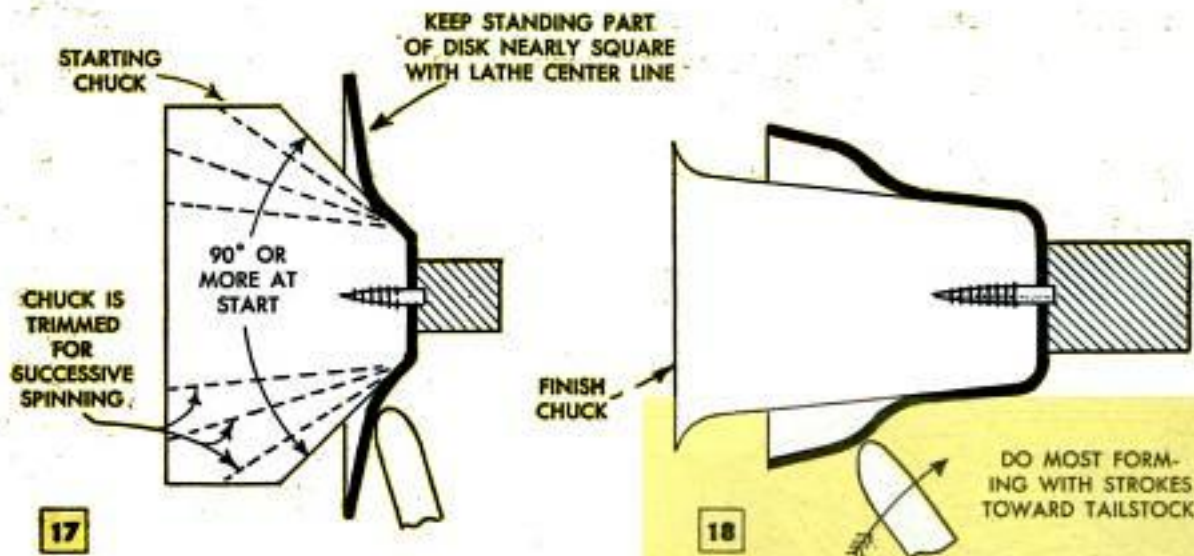
Candle cup, pictured above and detailed at left, is spun over what is called a high form. Chuck is turned down by stages to bring work to required rise. Metal must be annealed frequently



readily when pressure is applied, detail A, Fig. 8, but the rim bells back toward the tailstock as in detail B. Straighten the rim with the back stick as in Fig. 6 and the detail C, Fig. 8. When spinning the next $\frac{1}{2}$ in. of metal onto the form, make the stroke toward the base of the chuck as in detail D, Fig. 8. From this point on the process repeats. Spin $\frac{1}{2}$ in. of metal onto the chuck, straighten the standing edge, then continue spinning by $\frac{1}{2}$ -in. stages until the bowl reaches its full form. As the final step trim the edge as in Fig. 7.

Edges: A flared edge forms naturally in the spinning process, Fig. 11, but the edge can be spun tight to the chuck and finished square if desired. The popcorn bowl, Fig. 3, has a flared edge. Applying pressure on the left side of the flare with the back stick will widen it or start a roll as in Fig. 11. This can be carried over to form a bead or pressed flat to form a hem, Fig. 11. Turning the roll over to form a bead requires considerable practice and the process is somewhat difficult to picture clearly in sequence. After the roll has been turned slightly more than that shown in the upper right-hand detail in Fig. 11, it is helpful to file a half-round notch in the end of the forming tool and use this to turn the bead to the full form.

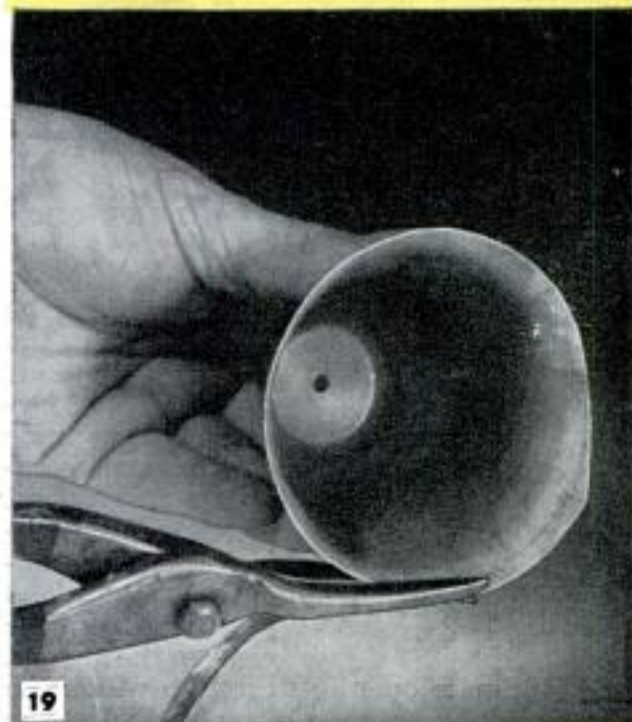
Copper lamp base: This project, Figs. 9, 10 and 12 involves reverse chucking of the base and high spinning over a long form to shape the candle cup. Both parts of the base are of copper which must be annealed while spinning. These requirements put the job up in the professional class. Note the spinning characteristics of copper in Fig. 2. The tray requires reverse chucking detailed in the three steps in Fig. 9. With the experience acquired in spinning the popcorn bowl, you won't have any trouble with the lamp base and reverse chucking



the tray will require a little more time, but high-spinning the candle cup takes more skill.

High forms: Figs. 13 to 19 inclusive picture the procedure in spinning the candle cup on a high form. It will be noted that the rise of the curved portion of the cup is considerably greater than one third its diameter. This classifies the job as high-form spinning and means that it must begin on a starter chuck as in Fig. 17 and finish as in Fig. 18. In this case the chuck is trimmed for the successive spinning stages. The included angle of the chuck should be at least 90 deg. at the start. Some shapes will require a starting chuck of 120-deg. included angle. Each time the chuck is trimmed it is necessary to spin the metal down to the chuck throughout the full length, as otherwise you may experience trouble with cracking. Fig. 14 shows the first stage nearly complete; Fig. 16 pictures an intermediate stage and Fig. 13 shows the final roll-over being made at the rim. Copper "grows," or "builds," considerably as it is spun and must be held to a uniform stretch by making most of the forming strokes toward the tailstock of the lathe. Even with this precaution it may be necessary to trim the excess metal as in Fig. 19, when the shape nears the final form. Trimming off excess metal relieves stresses to some extent and may help to prevent cracking near the rim, a common trouble when spinning over a high form. Keep the work well lubricated with beeswax as the spinning progresses.

Annealing: When spinning copper over any form having even a slight rise it is necessary to anneal frequently. Pressure of the forming tool crystallizes (hardens) copper quickly. In average spinning procedure the change will be noted immediately by the operator due to the sudden



Metal spun over high form tends to stretch. Edge usually must be trimmed before spinning to final shape

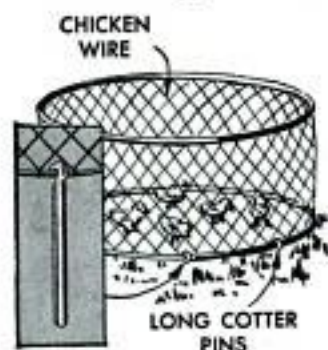
increased resistance of the metal. When this occurs stop and anneal. Clean off the beeswax lubricant with turpentine and place the work over a gas burner as in Fig. 15. The temperature of the metal should rise until it "blooms" into colors and then turns black. A few seconds after it blackens remove from the flame and quench in water. In some cases it is advisable to permit the work to air-cool, especially when it is in the final stages of high spinning. The black scale left on the surface will do no harm and is easily removed in the final polishing operations. A quenching solution of five-percent sulphuric acid will keep the metal clean. *Caution:* Sulphuric-acid solution must be handled with care. Do not permit it to come in contact with the skin. Dispose of all unused portions. ★ ★ ★

Metal Chute Extension Attached to Loader "Lifts" Hay Bale



When a bale loader is not available, a sheet-metal chute extension attached to the baler enables one man to load bales into a trailer that is tandem-hitched to the machine. A 24-in. extension is added to the frame of the baler, and hinged to this is a 30-in. slide. The angle of the slide is regulated by the supporting chains on each side. To strengthen the pivoted slide and make it more rigid, lengths of 2-in. steel angle are welded to the sides. To prevent the bales from bending as they come out of the baler and start up the slide, a 7-in. section is removed from the top lip of the baler just above the point where the chain bolts to the side.

Anchor Portable Baby-Chick Pens With Long Cotter Pins



Long cotter pins slipped over the bottom edge of portable baby-chick pens made of wire mesh provide a convenient means of anchoring them to uneven ground. The pins pull the wire close to the ground

and eliminate openings through which the chicks might escape. Left on the wire, the cotter pins will not be mislaid easily and can be stored along with the pens.

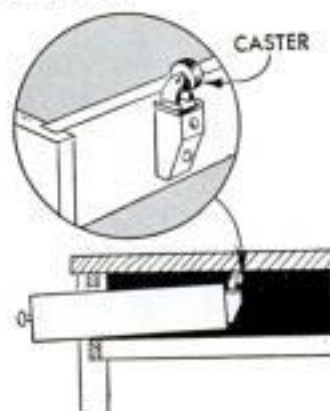
Rubber Band Is "Third Hand" When Routing on Drill Press

When routing with a drill press, a heavy rubber band may be used to supply the "third hand" required when simultaneously holding the work, holding the spindle at the proper depth and locking the spindle in position. The rubber band is passed from one arm of the spindle feed to some point on the drill press so that the spindle is held down against the depth stop. It then is possible to hold the work with one hand and lock the spindle with the other.

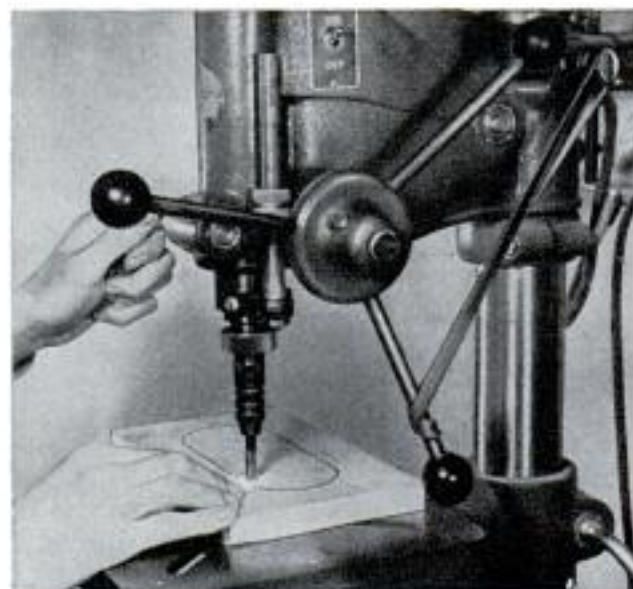
☛ A tablespoon of citronella, pine or cedar oil added to each gallon of exterior paint will discourage insects from landing on a freshly painted surface.

Caster Assures Easy Operation Of Heavy Tool Drawer

A furniture caster, fastened to the back of a heavy-laden tool drawer in a workbench, will prevent the drawer from being difficult to open and close. The caster is first mounted on a wooden block which then is bolted to the back of the drawer so that



the caster bears up against the top of the bench. Drilling matching holes in the block and drawer while they are outside the bench makes it possible to bolt the block to the drawer after it is in place. Depending on the design of the bench, the caster also may act as a stop to prevent the drawer from accidentally being pulled all the way out.



METAL FINISHING *with Disk Sander*

By L. H. Houck

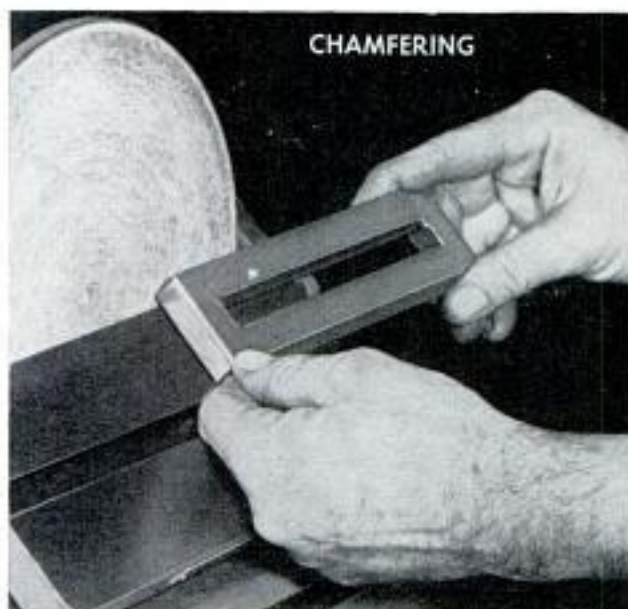
GRINDING AND POLISHING a variety of metals can usually be done in the home shop by utilizing an ordinary disk sander faced with a suitable abrasive. Any type of disk sander will serve the purpose but those having a belt drive usually permit a change of speeds which is an advantage in grinding and polishing metals. To be effective the disk should be 8 to 12 in. in dia.

Generally the medium and fine-grit abrasives give the best results, although where considerable metal must be removed the coarser grits are satisfactory. Aluminum-oxide grits range from No. 12 to 24 in the coarse; No. 30 to 60 in the medium and No. 70 to 120 in the fine grit. The coarse grits cut much faster than the finer grades and the cutting action generates less heat. However, the coarse abrasives leave a swirl pattern on the surface which must be removed by fine-grinding and polishing if a high finish is desired.

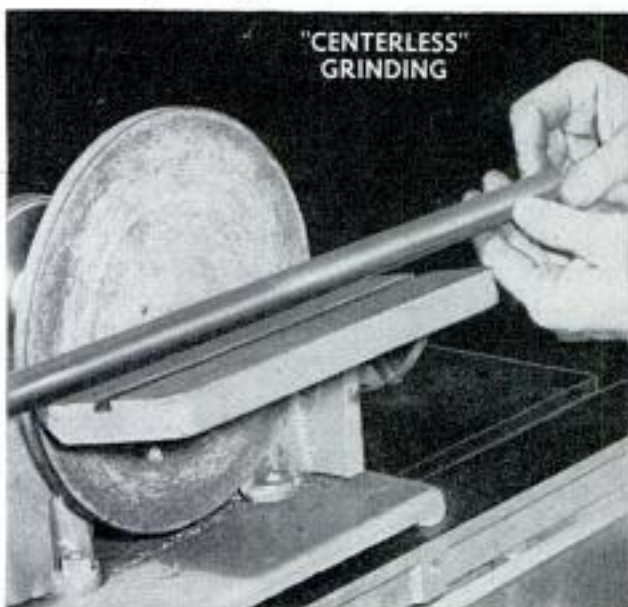
For chamfering, or breaking corners as the operation is sometimes called, a coarse abrasive generally is best. In this operation the sanding table is tilted down as in the upper photo at the right. Both chamfering and finish-grinding should be done on the "down" side of the disk, that is, the half of the disk that is running down in relation to the sanding table. When the size of the work makes it necessary to use both sides of the disk, the pressure should be eased somewhat as otherwise the work may tend to chatter on that side of the disk which is going up.

By tilting the table inward about 10 deg. a length of shafting can be ground quite accurately as in the center photo. The trick is to keep the shaft turning uniformly while it is in contact with the disk. Also, it must be moved back and forth simultaneously. Usually this can be done by hand as pictured, but if a lathe dog is clamped onto the end of the shaft to serve as a hand crank, the work can be rotated with a somewhat greater uniformity.

The abrasive disks used for sanding wood also are satisfactory for light grinding and polishing of the softer metals, but "dull" quickly when used on steel. Use aluminum-oxide abrasive on harder metals. When applying the abrasive to the disk be sure that it adheres tightly to the edges, as otherwise it may tear.

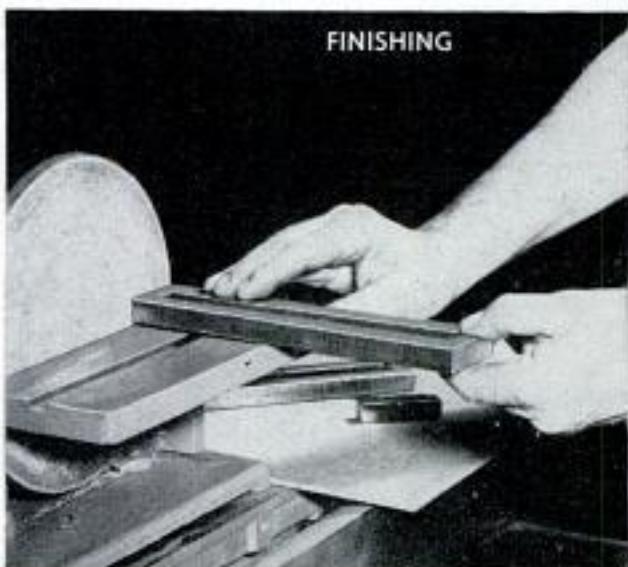


Chamfering corners is done by tilting the sanding table down to 45 deg. Use medium to coarse abrasive



Polishing, or "centerless" grinding of steel shafting requires that the table be tilted up about 10 deg.

A fine abrasive is used for finishing metals as it does not leave swirl marks on the surface of work



PREVENT RUST

in damp basements

A few simple precautions will ward off rusting of tools, furnaces, and other household equipment in basements which are damp in summer

By Robert Scharff



WHEN THE HEATING SYSTEM is shut down for the summer, the moisture content of the air in the basement rises rapidly to the point where it can cause serious damage to unprotected metal surfaces. Tools hanging on wall racks or stored in drawers are especially susceptible to rust damage, also circular saw blades, work tables of power tools, washing machines and any metal furniture in the recreation room. Nonmetallic items such as clothing, shoes and wooden furnishings will be damaged by high humidity if exposed over long periods of time.

Tools stored unused during the summer months can be sprayed with a clear plastic of the type supplied in pressurized containers, Fig. 1. A polarized oil also is available in the same type container and is especially handy for the purpose of protecting small tools. When there is the possibility that the tool may be used intermittently, the oil is preferable to a plastic

Chemical rust removers should be used to clean tools before applying corrosion preventives to surfaces



coating. If the tools are slightly rusted they should be cleaned thoroughly with a rust remover before storing, Fig. 2. Tools stored in drawers can be protected with a drying, or dehydrating, agent such as that supplied in small bags, Fig. 3. Care should be taken to arrange the tools so that the bag can be placed in an open area on the drawer bottom or in a small container such as a pie tin. Never lay the bag on the tools or adjacent to them as the moisture collected by the chemical will drip on them and defeat the purpose of the whole procedure.

Ordinary light machine oil also is a sure rust preventive if it is applied with care to all exposed surfaces of the tool, Fig. 4. In any case, a lubricating oil should be applied sparingly. It can be applied with the oil can directly on the surface and then spread in a uniform film either with the finger tips or a small cloth. Some homeowners keep an oil-saturated cloth handy in an air-tight container for wiping a thin film of oil on

Dehydrating agents which absorb moisture from the air can be used in tool drawers to prevent rusting



machine tables and tools immediately after use. **Caution:** Never leave oil-soaked cloths lying about in a drawer or on the workbench, as they are a fire hazard. Always keep them in a tightly closed container.

Wood-boring bits are especially susceptible to rust damage and they are difficult to coat adequately with a rust preventive. Perhaps the best method is to place a small quantity of light grease or petroleum jelly on a cloth, then simply roll or twist the bit through a fold of the cloth held between the thumb and forefinger as in Fig. 5. This method coats the flutes of the bit uniformly. The same method can be used to protect twist drills, reamers and carver's gouges having deep flutes.

Another method of protecting tools or parts not subjected to constant handling is to coat them with metal blue, Fig. 6. An ordinary Prussian blue (sometimes referred to as diemaker's blue) can be used for this purpose, or you can use a touch-up gun blue, which is a type of lacquer. Both coatings are quickly removed with a solvent, such as lacquer reducer. On irregularly shaped parts these protective coatings are best applied by spraying.

Ordinary paste wax is a good protection against rust on surfaces of tools which permit its application in a uniform film, Fig. 7. First the tool must be thoroughly cleaned. Dirt and hardened oil can be removed by placing a few drops of cutting oil on fine steel wool and rubbing the metal surfaces. Wipe the surfaces immediately with a clean cloth dipped in solvent. Then apply the wax and polish lightly. When the wax coating becomes worn so that it no longer offers complete protection, it is easily removed with turpentine and a new coating applied.

For cleaning some types of small tools,

Hardened oil and rust are removed from tools by rubbing with steel wool and few drops of cutting oil



Light machine oil applied to exposed metal surfaces is always reliable as a rust preventive on hand tools

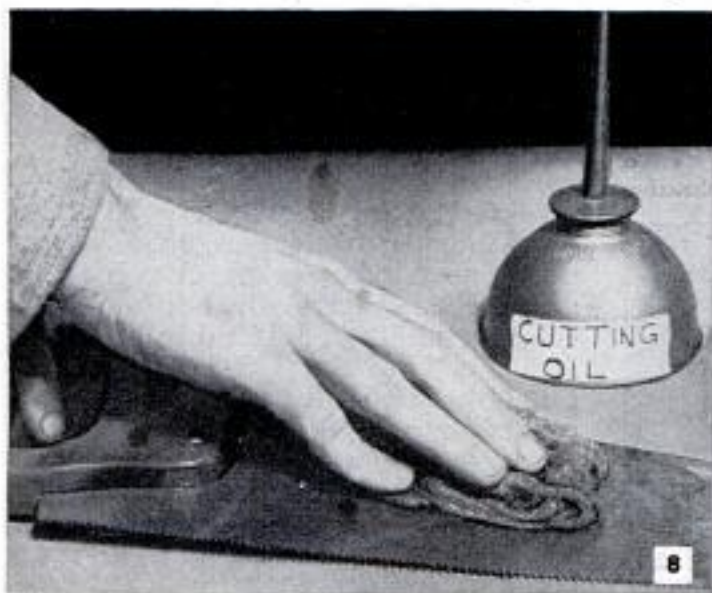


Wood-boring bits stored in a box should be protected with light grease or petroleum jelly applied with cloth



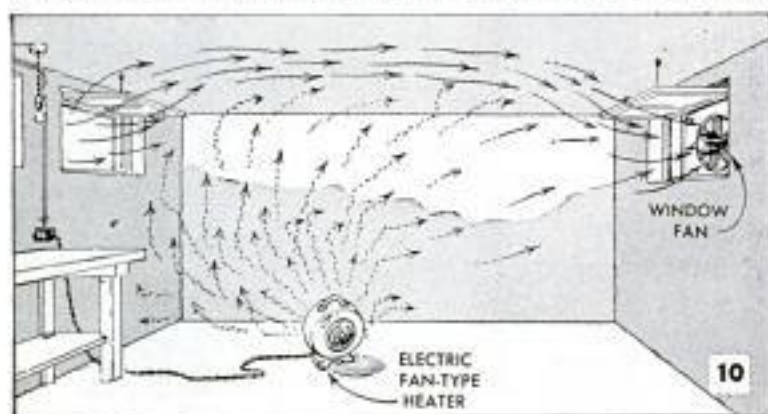
A coating of metal bluing will protect tools and machine parts from rust. Apply with a brush or spray

Ordinary paste wax also is good. Before applying wax clean the tools as in Fig. 8 and wipe with solvent

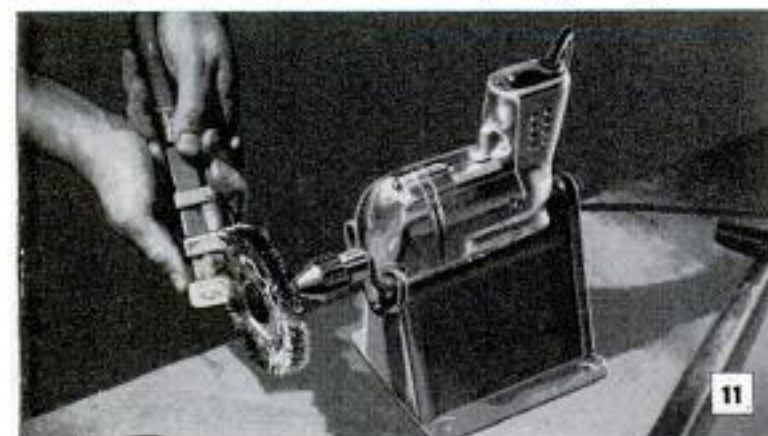




In time, rust will work through the protective galvanizing on ducts of the heating system. Aluminum paint is added protection

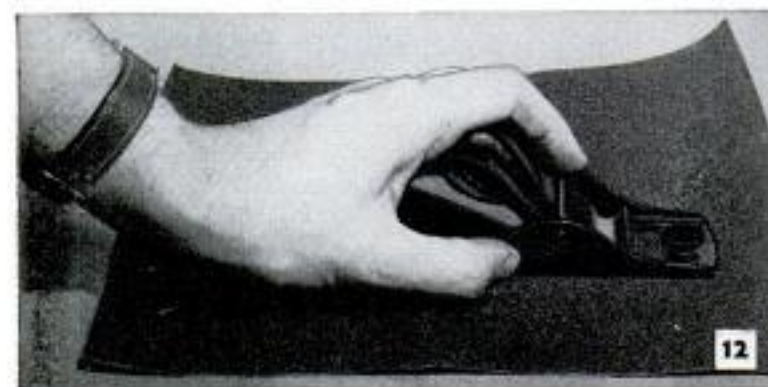


Heat and ventilation will dry a basement quickly. One method of turning the trick is detailed above, using fan-type heater



Certain tools are cleaned with a power-driven wire wheel which gets into corners that can't be reached by other methods

Bottom of a hand plane is easily polished by rubbing on a piece of emery cloth placed on flat surface. Use fine abrasive



a power-driven wire wheel, or scratch wheel as it is often called, is effective in removing rust and hardened oil as it will work into tiny crevices and corners that cannot be reached by any other means, Fig. 11. The wire wheel can be driven by a portable drill as shown, or it can be mounted on a small grinder or a lathe spindle. When it is necessary to polish the bottom of a hand plane, place a piece of emery cloth on a flat surface and rub the plane over it as in Fig. 12. Withdraw the plane iron, or cutter, first and then use a straight back-and-forth stroke. If desired, the sides of the frame can be polished in the same manner. After carrying out these preliminary operations the bright surfaces should be protected with a suitable rust preventive.

Even though protected by galvanizing, the cold and warm-air ducts of the heating system are likely to be damaged by rust after exposure to high humidity over a period of several seasons, especially at points where the protective galvanizing has been broken or otherwise damaged at the time of installation. Additional protection is provided by a coat of aluminum paint applied with a brush as in Fig. 9, or with a spray gun, or pressurized container. Do not use varnishes or ordinary paint on surfaces that get hot. If the furnace is gas-fired turn off the pilot light (also in the water heater) before spraying paint.

Many homeowners operate an electric dehumidifier during the summer months when excessive humidity is a problem in the average basement. These units give satisfactory service when operated according to the manufacturer's instructions. There are other methods of reducing the moisture content of the air. Moisture-absorbing chemicals are quite inexpensive and are usually satisfactory in basements of average size. Another method of lowering humidity is detailed in Fig. 10. It is effective, but is sometimes objectionable because of the cost of operating the heating unit. Leaving the basement windows open on cool, dry nights will help prevent condensation. Always wipe tools after handling, as perspiration can cause rusting. ★★

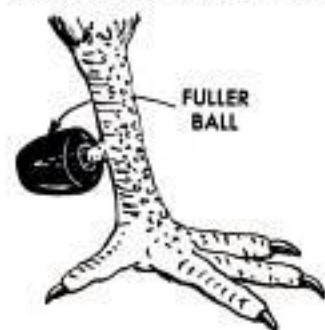
Cake Tin on Pole Stuck in Ground Frees Hands of Berry Picker

To free both hands for picking berries, one gardener made a self-supporting container for the berries by forcing an angel-food cake tin over the end of a pole, which then is pushed into the ground. If the pole to be used is smaller in diameter than the top of the cone section, stretch a piece of rubber tubing over the end, or drive in a finishing nail so the ends project sufficiently on both sides to hold the pan in place. If the device is to be made permanent equipment, secure the upper end of the cone with nails in the exact position desired.

Kink for Rethreading Pump Rod

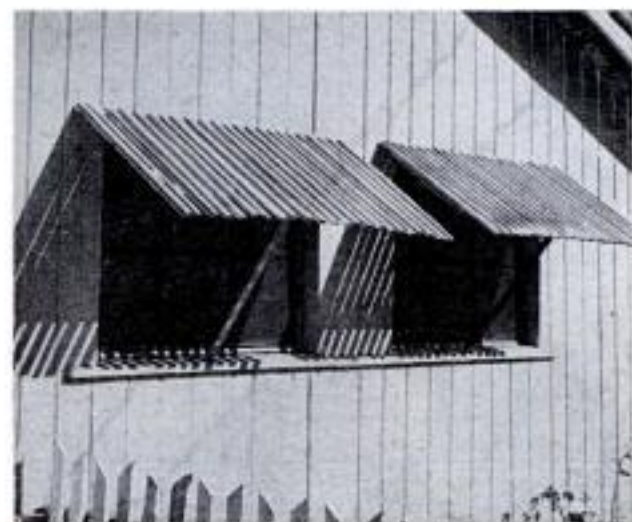
When rethreading the pump rod on a well pump, there is a possibility of the metal shavings dropping into the pipe and eventually damaging the leather valves in the cylinder. To prevent this, one farmer simply impaled a large potato over the end of the rod, slipped it down until it uncovered the end of the pipe and then proceeded with the rethreading operation.

Belligerent Roosters' Spurs Covered With Fuller Balls



One poultryman, seeing that belligerent roosters were injuring some of the weaker birds in the chicken yard with their sharp spurs, forced fuller balls over the spur points. The holes in the balls were reamed

out slightly but left small enough to fit tightly on the spurs. When properly fitted, the balls stayed on indefinitely and provided an effective guard.



JUNE 1954



Chimney Calking Kept Tight By Screen-Wire Reinforcing

If screen wire is used as reinforcement under the calking around a chimney, the calking will have less tendency to crack and pull away from the bricks to cause a leak. The screen wire is tacked directly to the chimney and to the roof and the calking compound is applied over it. The compound should be forced into the mesh of the screen. Hardware cloth may be used in place of the screen wire.



Double-Layer Awnings Permit Free Air Circulation

In providing shade and shelter from rain for windows of his milkhouse that ordinarily are left open throughout most of the year, one farmer installed double-layer lath awnings through which air can circulate freely. Nailed alternately to both sides of wooden cleats, the lath are spaced so those on one side are directly opposite the spaces between those on the other side. If lath is unobtainable, lattice stock will do.

Remove rust stains from concrete surfaces by scrubbing with a solution of oxalic acid powder, 1 lb. in water, 1 gal.

197



Pumper provides a fast, effective fire-fighting unit for quick action against spreading grass and brush fires

Glenn - Tree Farm Management Service, 364 E. Broadway, Eugene, Oregon

FARM "FIRE ENGINE" fits pickup truck

WITH THIS HANDY pumper always ready you can get water onto a fire within minutes after it starts. It will throw a stream more than 60 ft., making it a fast, effective fire-fighting unit for any farm or estate. Originally designed by foresters as a permanent installation in a pickup truck, the pumper has been made portable by building it as a self-contained unit that can be loaded and unloaded from the truck as in Figs. 1, 2 and 3. In this way the

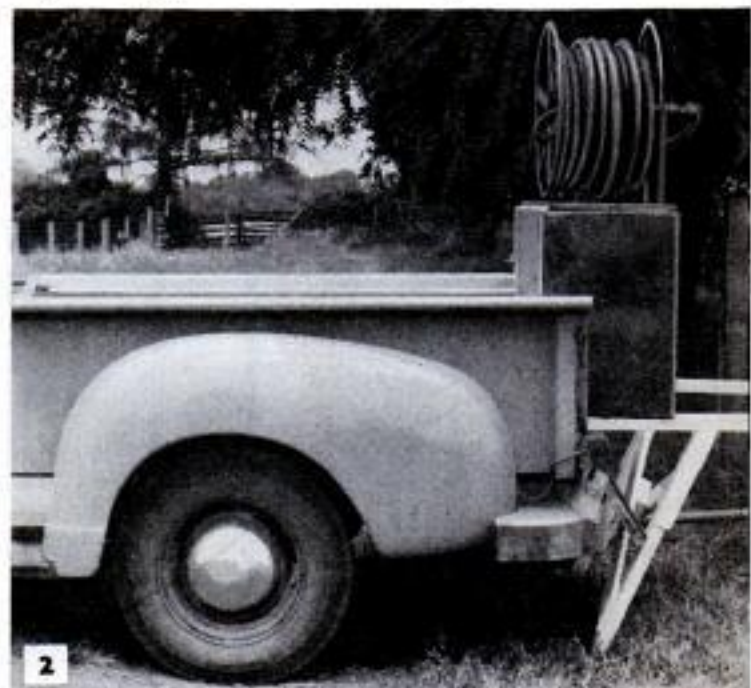
Here the portable unit is shown ready for loading into the pickup truck, which is being backed up

truck is left free for other uses, as only the pump is attached permanently to the power take-off on the truck transmission, Figs. 5 and 7. The pump is of the direct-drive type, Fig. 4, designed for mounting on a tractor as part of an orchard-spray unit. The suction and discharge lines from the pump are permanently attached to the truck. These lines are fitted with quick connectors, of the type used on fire-fighting equipment.

Loading is mostly automatic. As truck is backed, bumper pushes support back. Platform drops on truck bed



1



2

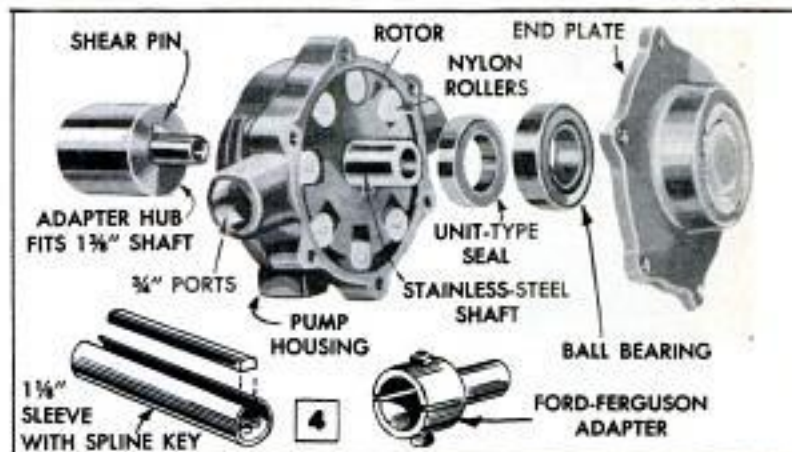
As originally designed, the pumper unit was fitted with a rectangular sheet-metal tank as pictured in Figs. 1 and 2. A 55-gal. drum, Fig. 5, is a good substitute. Where greater capacity is desired it is possible to adapt a 100-gal. cooling tank of the type used in dairies for cooling milk. These tanks are 24 in. deep, 24 in. wide and about 48 in. long. A tank of this type can be fitted with sheet-metal cover on which the control unit, Fig. 5, is mounted. For quick handling from a platform, a tank of this size, when filled with water, should be skidded or mounted on a dolly for easier handling from platform to truck.

The platform, which provides storage for the tank when not in use, should be located where it is easy to swing the truck and back up with the truck body in line with the platform. The latter is hinged at the rear end and is supported at the front by X-braced legs as in Fig. 1. The height is such that the truck bed will slide under the platform when the truck is backed as in Fig. 2. The support, which is not attached to the platform, is forced back by the bumper as shown. This permits the platform to drop onto the truck bed, automatically "loading" the tank unit.

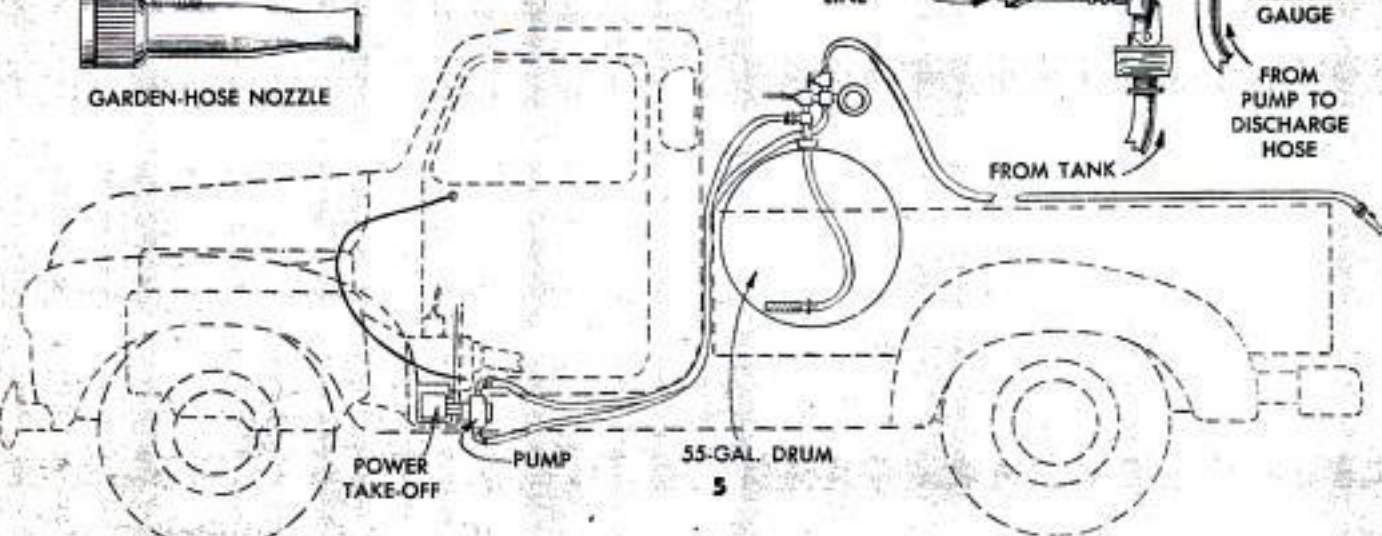
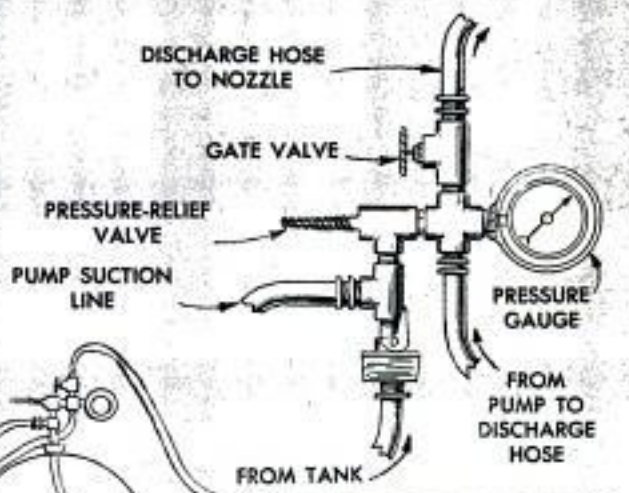
Just how the procedure is carried out depends on the water source. Where this is some distance from the buildings, then the tank should be kept filled while it is stored on the platform so that it is always ready for an emergency. The tank can be filled from the stock tank, farm pond or near-by creek as in Fig. 6,



In this view tank is loaded ready for use. Note how platform extends into truck bed for easy loading



Pump is orchard-spray type and is direct-driven from power take-off on truck transmission. See also Fig. 7

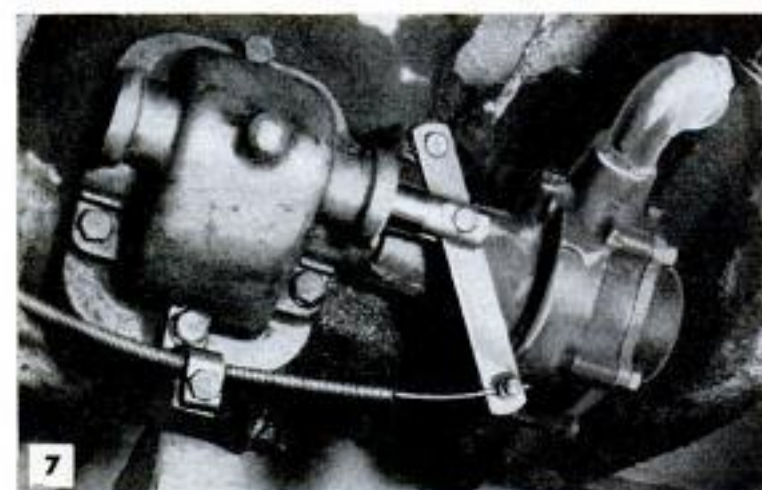




6

Here water is being pumped from the farm pond. Note the long suction line. Throws stream more than 60 ft.

Below, the pump is close-coupled to the power take-off and is driven direct. The power take-off is controlled from dash



7



8

which pictures the pumper under test. In this case it's a good idea to mount the tank on a dolly so that it is more easily handled when loading and unloading onto the platform. When a drum is used it should be mounted on a cradle and securely fastened on the cradle with steel bands. The control unit is attached to the barrel as in Fig. 8 with an expansion-type quick coupling, that from a war-surplus gasoline can being just the thing for the purpose.

The control unit, Fig. 5, consists of a suction hose and strainer, a $\frac{3}{4}$ -in. pipe cross, two tees, nipples, pressure gauge, relief valve and a gate valve on the discharge line. Two 9-ft. lengths of hose (300-lb. pressure) connect the pump with the control unit. These are attached permanently to the truck. For taking water from a pond or creek a long suction hose and strainer should be provided. The discharge line is made up from two 50-ft. lengths of 300-lb. hose and a garden spray nozzle. The latter is selected because of its quick adjustment to give a long stream or a wide spray. Other nozzles can be used. ★★★

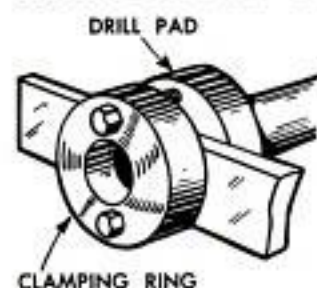
All photos courtesy American Forest Products Industries. Detail of pump courtesy Hypro Engineering, Inc.

Left, here water is being pumped from the tank through the discharge hose. A 55-gal. drum makes a suitable tank for average use

Tractor-Mounted Automobile Radio Supported by Pipe Pedestal

The news, ball games and weather reports are available to one farmer who has mounted a radio on the rear fender of his tractor. The radio is bolted to the top end of a pedestal made from two floor flanges screwed to a length of pipe. The flange on the lower end of the pedestal is screwed to a 2 x 4, which is bolted horizontally to the inside of the fender. The telescoping buggy-whip aerial is a unit of the car-type radio.—Charles L. Stratton, Hollis, N. H.

Flat Stock Drilled on Lathe With Drill-Pad Clamp



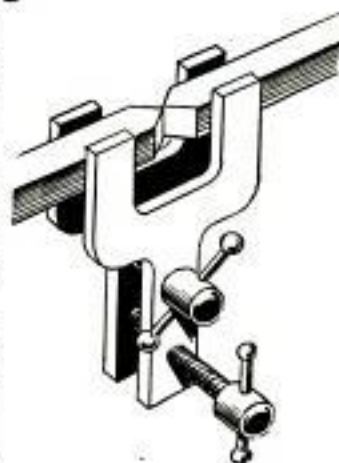
When a quantity of pieces of steel strap had to be drilled and the drill presses were tied up, one job-shop machinist rigged a disk-clamp on his lathe to handle the flat stock. The clamping ring was turned from a section of mild-steel bar stock, the hole being made slightly larger than the diameter of the drill to be used. The ring was drilled for two machine bolts, then used as a template to align the two holes drilled and tapped in the drill pad. In use, the drill is chucked in the head stock and the work is fed into the drill with the tailstock hand-wheel. This setup is useful in emergencies such as the one described, but has definite limitations. The drill pad may require annealing to allow it to be drilled and tapped, after which it is retempered.

C. W. Woodson, Miami, Fla.



Y-Jaw Clamp Aligns Work For Butt Welding

Consisting of two Y-shape pieces cut from steel plate, a Y-jaw clamp is a useful fixture for holding and aligning work to be butt welded. One side is drilled to clear two T-screws, while the other side is drilled and tapped to receive the screws. Nuts welded over clearance holes may be used instead of drilled and tapped holes.



Federico Strasser, Santiago, Chile.

Poultry-Wire Sections Can Be Joined for Use on High Fence



Narrow widths of poultry wire can be built up to any desired width simply by unrolling lengths of the wire side by side and twisting the outer strands together in the manner pictured. A small nail that will clear the two halves of the mesh will serve as a "twisting stick." Hold the strands together, insert the nail between them, and then give the nail four or five turns, thus twisting the strands together. The strands should be joined in this way at every third or fourth mesh opening along the full length of the wire.—Ed Packer, Chicago.

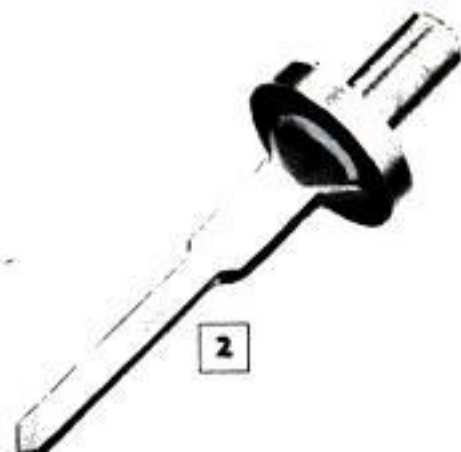
☐ To inexpensively dustproof and improve the appearance of ragged hot-air-duct openings, dissolve asbestos pipe coverings in water until the mixture is the consistency of a mortar, then trowel on.

SHOPPING FOR TOOLS

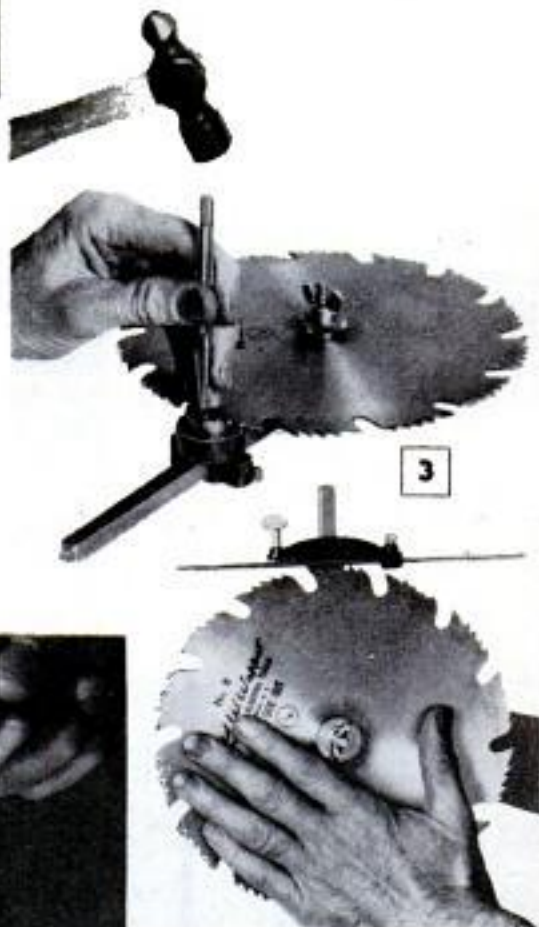


1. PREHEAT ELECTRODE is inserted in the electrode holder of a d.c. arc welder and is used for annealing, heat treating, burning off paint and preheating. Displaces other outside heat sources where concentrated heat is needed in preparing work for welding. In use, the steel core of the electrode oxidizes and disintegrates into a fine powder which is easily brushed from the work. Especially effective in after-heating

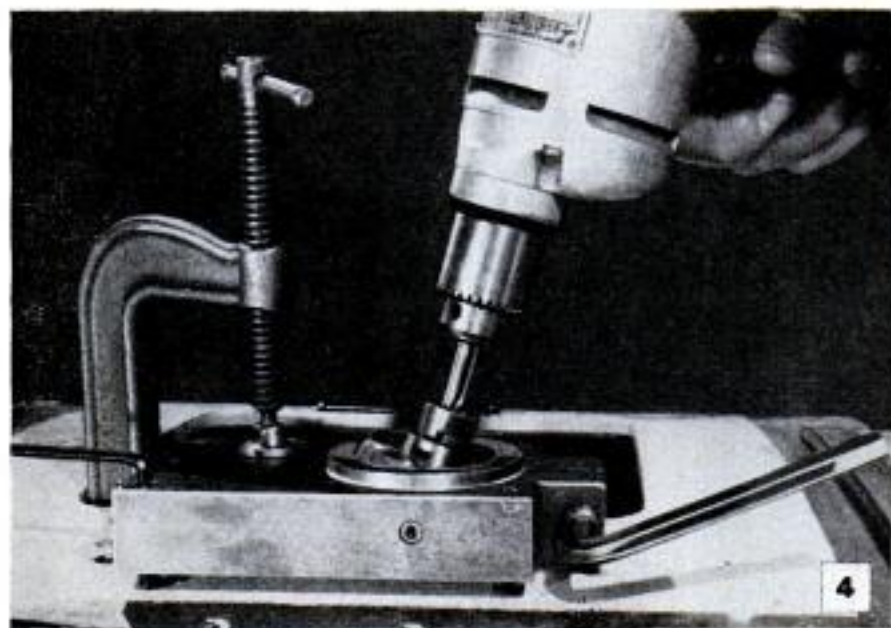
4. UNIVERSAL DRILL GUIDE enables operator to drill at an angle on a curved surface. Ball-shaped guide rotates in a socket that permits a universal setting. Guide is mounted in a steel base having five jackscrews turned into holes drilled and tapped in the lower face, one jackscrew being located at each of the four corners. The fifth screw provides for adjusting on irregularly contoured surfaces before clamping

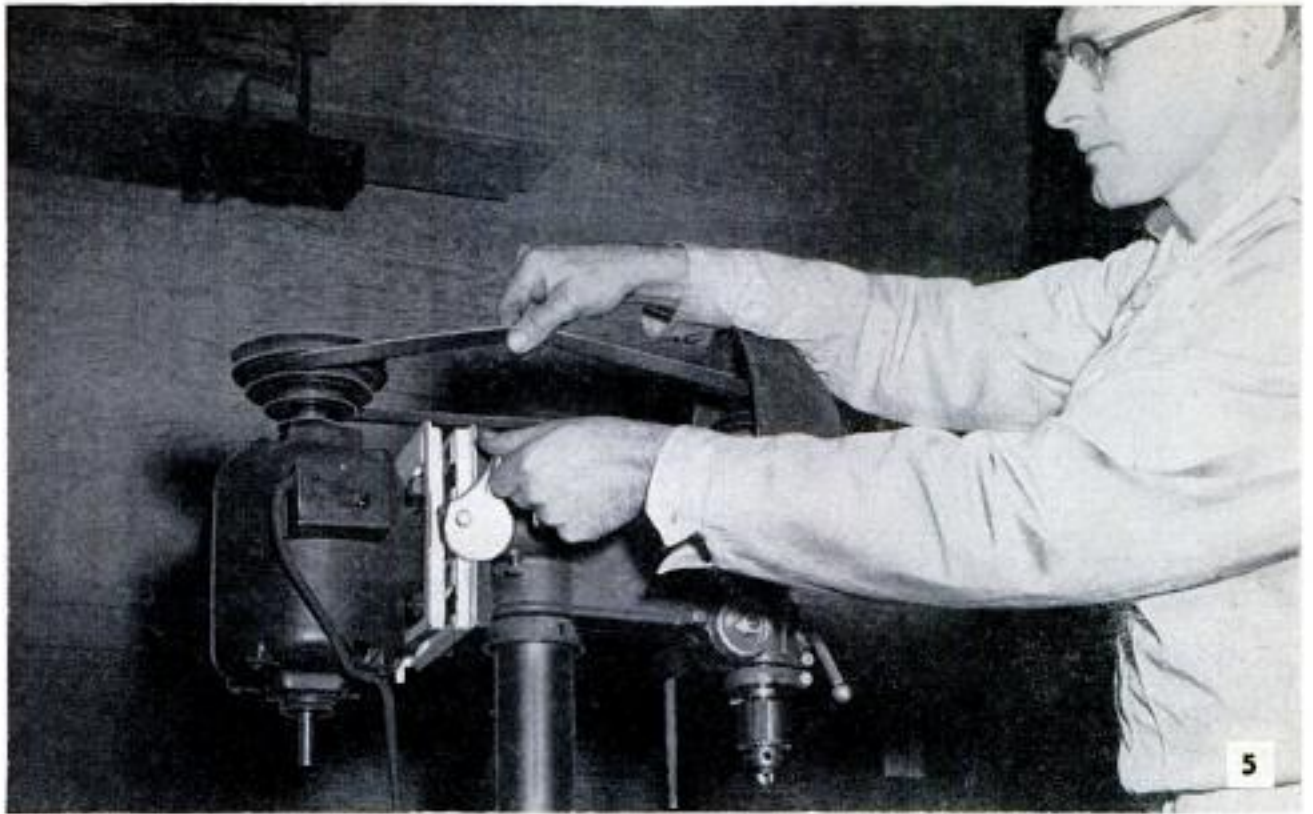


2. COMBINATION DRILL AND COUNTER-SINK has an offset which counterbores the pilot hole for the shank of a wood screw. Also available as a counterbore for sinking head of screw below the surface. Available in all common wood-screw sizes and types



3. SETTING STAKE AND JOINTER for small circular-saw blades provide for perfect setting and jointing of the blade preparatory to filing. Jointer attachment comes complete with special file. For jointing, setting anvil is removed and replaced by jointer as in lower photo. Takes blades from 6 to 12 in. in dia., holes from 1/2 to 7/8 in.





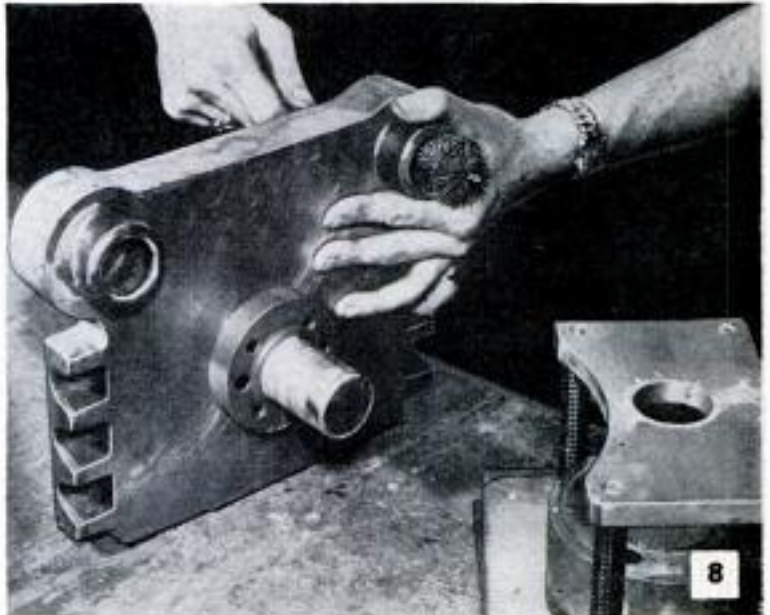
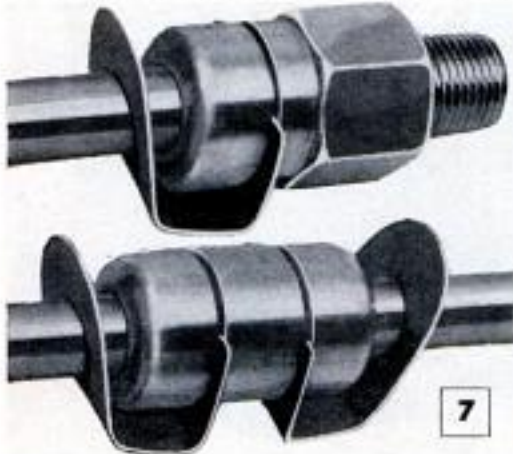
5. HINGED MOTOR MOUNT provides easy adjustment of belt tension on a drill press. Rotating cam in one direction slackens belt for changing from one pulley step to another. Moving cam in opposite direction tightens belt to proper tension. Cam is notched to engage lug on hinged plate. It is not necessary to drill holes to mount



6. FUSE PULLER combines a circuit tester for use on 100 to 600-V. lines a.c. or d.c. Electrodes are in the handles. One glows on d.c. and both glow on a.c. Both are replaceable. Handles fuses up to 100 amp.

8. ROUND STIFF-BRISTLE BRUSH is especially made for cleaning leader-pin holes in die sets. Bristles are of selected genuine horsehair which is resistant to acids and alkalis common to most detergents and industrial cleaning fluids. It is available in sizes ranging from $\frac{3}{8}$ to $2\frac{3}{4}$ -in.-bristle dia.

7. SPRING-CLIP CONNECTOR for tubing connections which must be liquid or gas tight, consists of a connector, or coupling and a special spring clip which is depressed as tubing is inserted. No wrenches required



Manure Spreader Provides Rig to Unload Ear Corn Quickly



B. P. Settle of Golddale, Va., unloads ear corn into the elevator hopper without use of a wagon jack. He simply adapted an old manure spreader for the job by removing the beater, reversing the ratchet wheel and mounting a lever and ratchet dog on the rear apron shaft. When the lever is pulled down, the apron is moved toward the rear of the bed, dumping the load by stages into the elevator hopper, also built by Settle. The elevator is equipped with a hopper that will swing up or down, or sideways, to facilitate unloading.

G. E. McVickar, Bethesda, Md.

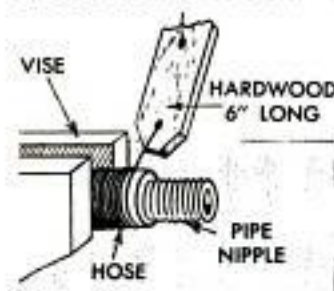
Small Paint Can Wedged in Pail Reduces Cleaning Problem

WEDGE SHAPED
BLOCKS



When using a small can of paint to do touch-up work, three wedge-shape blocks can be used to hold the smaller container firmly inside a regular-size paint pail and reduce the chance of spilling. Also, the paint pail will not have to be cleaned.

Air-Hose Connectors Clamped With Hardwood Tool



When one maintenance mechanic found that ordinary air-hose clamps were too light to stand up under severe working conditions, he devised the following

method of clamping the hose to the pipe-nipple connectors. A tool is made from a 6-in. length of hardwood—a discarded hammer handle is good—into which two $\frac{3}{8}$ -in. holes are drilled. One hole is about $1\frac{1}{2}$ in. from the end, the other about 2 in. from the first. A No. 18 iron wire is threaded through these holes. The air hose is fitted with a properly notched pipe nipple and clamped in the vise, along with the end of the wire. Using the hardwood tool for leverage, the desired tension can be given to the wire. A band of turns of wire about 1 in. wide is sufficient.

H. B. McDermid, Norwood, Ohio.

Burred Hole for Tapping Screw Enlarges Thread-Contact Area

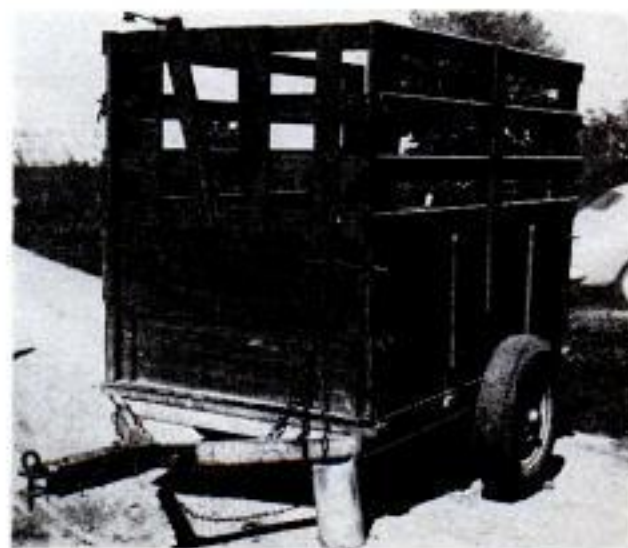
To increase the holding power of self-tapping screws, many sheet-metal workers punch undersized holes to receive the screws. By backing up the work with a soft anvil or a block of hardwood, the hole is burred or flared, greatly increasing the contact area of the threads. Where it is necessary to lap sheets with registering holes, the latter are drilled first with an undersized bit and then flared with a tapered punch.

Allen Zerbel, Sacramento, Pa.

Stanchion in Livestock Trailer Eliminates Usual Tail Gate

Individual dairy cows, accustomed to barn stanchions, are easily induced to enter this trailer with its single stanchion built into the headboard of the livestock rack. When the cow's head is locked in the stanchion, the need for a high tail gate is eliminated. Also, the animal is less likely to be injured by sudden stops or sharp jolts when the trailer is being towed.

Kenneth R. Imig, Watseka, Ill.



POPULAR MECHANICS

TAKE Vacation Pictures

**ANYTIME...ANYWHERE...
WITH SIMPLE PHOTO AIDS**

No need to miss out on any snapshots you want this summer. The inexpensive Kodak aids shown below can help you make good pictures day or night . . . indoors or out. They're easy to use . . . compact and handy. See them at your Kodak dealer's.



Flash is easy—Kodalite Flashholder (with Lumaclad reflector) for Brownie Hawkeye, Flash Model, and Kodak Duaflex III Cameras. \$4.



Dependable flash everytime with Kodak B-C Flashholder, \$9.95. Or use Kodak B-C Flashpack (inset, \$2.95) in Kodak Standard Flashholder, \$7.95.



For "close-ups" with most fixed-focus cameras, the Kodak Close-up Attachment, \$1.63. Kodak Cloud Filter (\$1.85) brings out clouds.



For dramatic shots—Kodak Wratten Filters (from \$1.75) fit most every camera; easiest way to improve both your black-and-white and color shots.



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To support camera and flash unit, attach to most any surface with sturdy Kodak Flexiclamp. Only \$4.95.



Get into your picture—Kodak Auto-Release trips shutter automatically at intervals up to 10 seconds. \$3.86.



Aid steady shooting—Kodak Metal Cable Releases fit most cameras having cable release sockets. Will not kink. From \$1.05.

Prices subject to change without notice

Eastman Kodak Company, Rochester 4, N. Y.

Kodak
TRADE-MARK

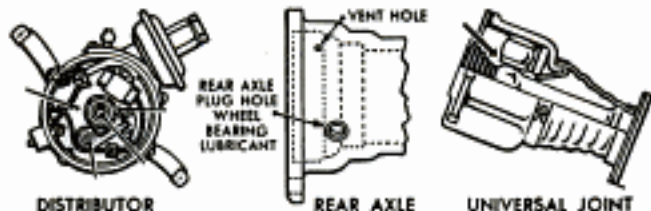
Care and Feeding of Engines



BY
S. P. CORP

SPECIAL LUBRICATION PROBLEMS

There are many places on your car that do not require lubrication at the regular 1000-mile interval, but which urgently need it at the appointed time. Among these are wheel bearings, steering gear, rear axle, etc.



DISTRIBUTOR

REAR AXLE

UNIVERSAL JOINT

AT 5000 MILES—Give distributor shaft wick three drops of oil. Give contact pivot pin one drop of oil. Coat the rubbing block with petroleum jelly. If an oil cup, give it five drops; if a grease cup, give it one turn . . . Check level of steering gear lubricant and add as much as needed . . . Give starter oil cup five drops of oil.

AT 10,000 MILES—Remove rear axle wheel bearing plug, install fitting, and use a low pressure gun with wheel bearing lubricant . . . Windshield wiper arm pivot, remove screw on top of mounting and inject a few drops of light oil, replacing screw.

AT 20,000 MILES—Disassemble universal joint, clean and repack with 1¼ ounces of heavy fibre universal joint grease. (Some cars require this at 10,000 miles.)

Also: Use lubriplate on hood lock, penetrating oil on door hinges, and door ease on door striker plates and dovetail as needed. Gearshift rod ends need water pump grease every 1000 miles.

DISTRIBUTOR TIMING

As engine speed increases, timing must advance if the engine is to operate smoothly. Most distributors use two governor weights, which are thrown outward as engine speed increases, rotating the cam ahead of the distributor shaft to advance the timing. If these weights become sluggish, the engine may lose power and waste fuel. To check timing, distributor should be removed and checked in a test fixture. This test takes only a few minutes, and is worth while to insure correct timing at all speeds.

SEND FOR FREE MANUAL

Sealed Power KromeX Ring Sets are factory sealed for fast break-in and immediate oil control. A card will bring your free copy of the valuable manual, "MORE POWER, Less Gas, Less Oil." Just address Sealed Power, Dept. G-6, Muskegon, Mich.



Sealed Power

PISTON RINGS

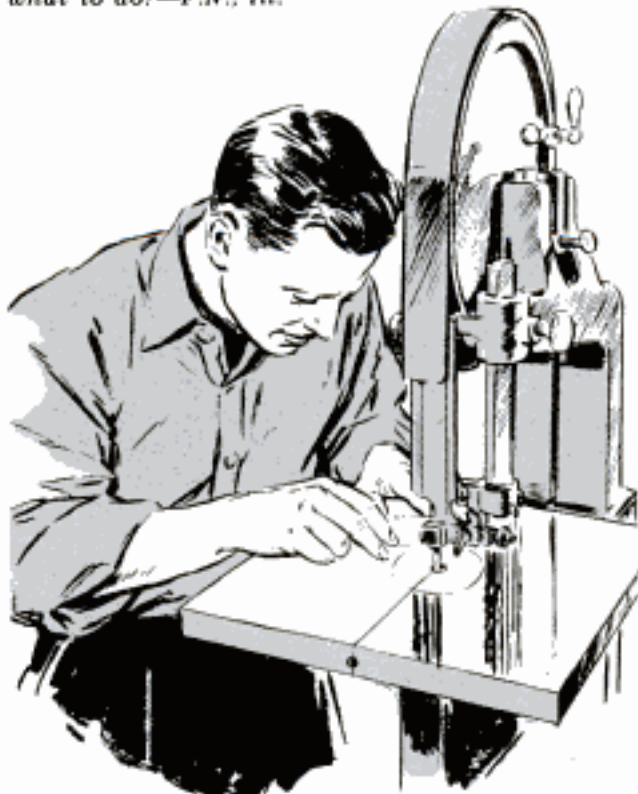
Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.

Blade Alignment

Q—I have a 12-in. bandsaw on which I have trouble aligning a 1/8-in. blade. The blade will not stay in the center of the wheel treads no matter how carefully the adjustment is made while the machine is running. Adjustment of the guides makes no correction of the trouble. Can you tell me what to do?—F.N., Ill.



A—Probably you are running the blade far too tight on the wheels, that is, too much tension for the size of the blade. This depresses the rubber treads on both wheels, causing the blade to "climb" and making it impossible to track properly. Release the blade so that it is slack on the wheels, then turn up the tension screw until the blade straightens. After straightening the blade, give the hand-wheel about three turns. Then start the machine and track the blade to the center of the wheels with the tilting screw. Probably it will be necessary to readjust both blade guides. Before adjusting the side pins on the guides, insert a thin sheet of paper between the blade and one pin. Press together with the fingers and tighten the lock screws to hold the adjustment. Run both guide rollers up to the back of the blade and test for smooth operation. Be sure

(Continued to page 208)

*America's Oldest Hydraulic Shock
Absorber Manufacturer Announces*

THE NEWEST WAY TO A BETTER RIDE

This may be the first time you ever saw a shock absorber. Yet your car's riding comfort and safety depend largely on your shock absorbers. That's why the new GOLDEN GLIDE shock absorbers are so important to you.

NEW

Golden finish makes it easy for you to be sure you're getting genuine GOLDEN GLIDE shock absorbers.

NEW

Fluted stone shield. Provides all-round protection from road damage.

NEW

Fluted dust shield. Protects parts. Dissipates heat.

NEW

Fluted design. Provides air cooling. Increases shock absorber life.

NEW

Custom-Built to fit your make and model. Does exactly the job your car needs.

IMPORTANT

Shock absorbers have a tremendous job to do—smoothing ride, controlling sway. They work hard—they do wear out.

MAKE THE BUMPER-JUMPER TEST

Stand on the corner of your bumper—rock the car up and down, then jump off. If your car moves up and down more than once, you need new GOLDEN GLIDE shock absorbers. Buy them from your nearest auto parts jobber, repair garage or service station.

*For a Better
Ride, its*

Golden Glide

SHOCK ABSORBERS

Custom-Built by Houdaille-Hershey Corporation
Buffalo 11, New York

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If You Make Painting a Hobby-



You'll get a lot more real satisfaction and pride of ownership out of a home that is clean and neat and trim in a fresh coat of paint! Pays its own way by improving your property, too!

Because Archer Pol-mer-ik contains polymerized oil, it gives you a tougher, more durable paint film than ordinary linseed oil. When you reduce your paints with Pol-mer-ik, they brush easier, level better, and give you a smoother, dirt-resisting finish. Wonderful brush conditioner, too!

Handiest single product in your house or shop. Does the job of a dozen specialized products. A few of

POL-MER-IK'S 101 HANDY USES:



REFINISHING ANTIQUES

PROTECTING LADDERS



SEALING SCREWS

PROTECTING GUN STOCKS



ARCHER
Pol-mer-ik
LINSEED OIL
PROTECTS MOST EVERYTHING

(Continued from page 206)

that the guides are not tilted sidewise with relation to the blade. If they are even slightly out of line the resulting friction will cause scoring and possible breakage of the blade. Some small bandsaws have a graduated scale on the tensioning screw which shows the proper degree of tension for blades of varying widths.

Building On Corner Lot

Q—I have a corner lot on which I plan to build a five-room house with attached garage. The lot is 80 ft. wide, but the long way is east and west. My problem is which way to face the house. The street along the south side of the property is heavily traveled. There are homes built along both the main street and side street. Do I have to build my home so that the front is in line with the other houses?—M.R., N. Y.



A—The first thing to do is determine the requirements of your local building code. You may be restricted by the code, your deed, plat or some other instrument binding upon the owner of the property in that particular locality. Also, we would consider thoroughly all the possible factors that might govern the facing of the house on the side street. Custom, where there is no other specific reason, seems to favor facing the home onto the main thoroughfare. In your case, if we understand your description correctly, we think it would be better to face the house south. Usually this facing of the home offers far more advantages than disadvantages. In most locations, a southern exposure gives the maximum in sunlight both winter and summer.

Repairing Cracked Linoleum

Q—The linoleum in my kitchen is quite old and worn and is beginning to crack irregularly in several spots. Can it be repaired successfully?

—B.B., Tex.

A—The extent of the cracking would have some bearing on whether or not the old linoleum is worth repair. It should be possible to repair short irregular cracks simply by cutting through the linoleum the full length of the crack, the knife blade following the irregularities. Then make a cut at right angles at each end of the crack. Lift the flaps thus formed and spread cement underneath. Press the flaps back in place and weight until the cement sets. In some cases a matching patch is more effective. Locate matching linoleum over the crack and cut through both thicknesses. This will give you a perfect-fitting patch.

From attic storeroom to cheerful bedroom in just a few days

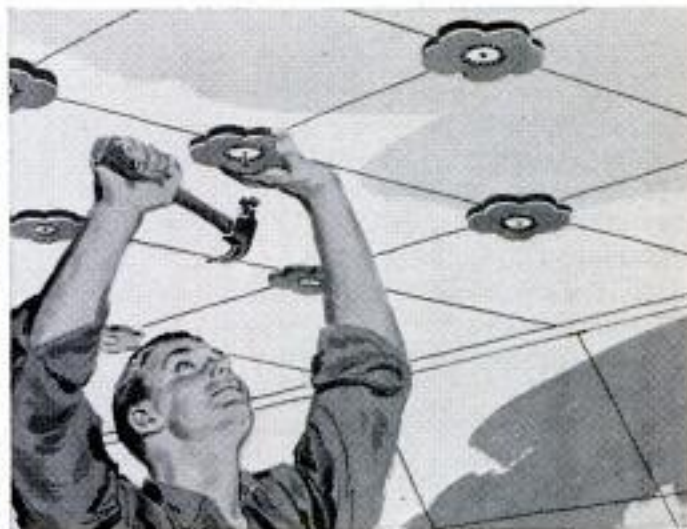
It's easy to add an extra room in your attic when you finish the walls and ceiling with Armstrong's Temlok® Tile and Plank. Temlok is an attractive fiberboard material that builds, decorates, and insulates in one quick installation.

A special Lok-Bevel joint makes nailing or stapling surprisingly easy. The joint also helps produce a fine finished appearance by hiding nailheads or staples. Both tile and plank are handsomely prefinished.

Remember Temlok can help you turn wasted space into extra living space at remarkably low cost. For full information on Temlok interior finish materials, see your Armstrong lumber dealer.



Nail 1" x 3" furring strips on 12" centers to all framing members as a nailing base for Temlok Tile and Plank. Both tile and plank can be nailed or stapled into place easily and quickly.



As a decorative touch, rosettes were cut out of wood, painted to match the colorful fabric design, and nailed to the ceiling. Temlok's Lok-Bevel Joint assures you a neat, professional-looking job.

FOR FREE BOOKLET, "New Ways to Remodel Your Home," write Armstrong Cork Company, 3706 Watch Avenue, Lancaster, Pennsylvania.



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Insulating Wool

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Get Good Performance the way Big Fleets do...

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As the nation's only common carrier with coast-to-coast authority, Denver Chicago Trucking Company meets every condition of road and weather. That calls for plenty of "muscle" in their truck engines.

Tip-top condition is maintained by a vigilant reconditioning schedule. Denver Chicago uses Federal-Mogul engine bearings for always-dependable heavy-duty service.

Federal-Mogul oil-control bearings have led in the replacement field for 30 years—because of *quality!* Get this quality, next time your car engine is overhauled. It costs no more to get the best — *ask your mechanic!* Federal-Mogul Service Division of Federal-Mogul Corporation, Detroit 13, Michigan.

for New Power . . .

FEDERAL-MOGUL Oil Control Bearings

BEARING
MANUFACTURERS
TO THE
AUTOMOTIVE
INDUSTRY
SINCE 1899



Here Come the Convertiplanes

(Continued from page 123)

inventor sets prop and rotor head idling at the flick of a switch. You imagine that the top wing is flying around like a helicopter rotor.

"We set pitch on the rotor blades," Herrick says, adjusting the vertical control as the rotor wing spins faster. "Now we're taking off like a helicopter, hovering if we like."

At proper altitude, he picks up forward speed like a helicopter would. "In this particular model we can start converting at 38 miles per hour," he explains, flipping the conversion control halfway. Instantly, the rotor head goes into free wheeling and the forward propeller picks up speed. "Now we're an autogyro," says Herrick. When the air speed reaches 70 miles per hour, the inventor throws his conversion control all the way forward. The rotor brakes to a halt, swings into position like a parasol-type wing, locks, and off we go—in a full-fledged airplane.

There's plenty of argument among convertiplaners about the best configurations for propellers and rotors. Gyrodyne is as sure of the virtues of its "coaxial" stacked rotors, as Jacobs Aircraft Engine Company is of the straight three-blade helicopter-type. Jacobs is testing a trim little model to seat four people. It has a standard torque prop, off the tail, that intermeshes with a pusher propeller sticking out from under the tail assembly for forward speed.

In some of the dreamier designs, a big rotor would be collapsed or telescoped and folded away in a top or side stowage space along the fuselage. Igor Sikorsky had a military convertiplane design which envisioned a one-bladed, counterbalanced rotor that could be tucked away when not in use. But the project is temporarily shelved. Peter Papadakos will tell you that the telescoping arrangement he figured out for a pair of 96-foot, 4-bladed coaxial rotors on a 44-passenger Gyroliner will work, "but poses many structural and engineering problems."

Arguments fly thick and fast about power plants, too. Burke Wilford thinks that the little ramjets on his rotor-blade tips will be the answer. Gyrodyne, which has tested rectangular ramjets, reports that four of these little engines will consume 2200 pounds of fuel in 15 minutes of hovering.

Whose ideas are best will not be proven until some of the convertiplane pioneers get their dreams in the air this year or next. Where they go from there is anyone's guess. Sikorsky doesn't think they'll go very far.

(Continued to page 212)

NOW YOU CAN SAVE UP TO 25% ON FUEL OIL

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Silent Automatic
"Wall-Flame" Oil Burner!

Your factory-trained Timken Silent Automatic Heating Expert is authorized to make a free survey of your present oil heating plant — to *guarantee in writing* fuel savings up to 25% over other types of oil burners. And you *will* get these savings, or your money will be refunded and your original burner reinstalled — free of charge!

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World's finest oil burner!
Scientific placement of flame, complete preparation of air-fuel mixture, gives unequalled efficiency and fuel oil savings.

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job to the finish...



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here's why

Look for the Channellock line when you're shopping for hand tools. Channellock pliers offer features that you can't get with other makes. And when you buy a Channellock plier, ask to see the full line—you'll find a style and model to do any job better.



CHAN NEL LOCK

TRADE MARK REG. U. S. PATENT OFFICE

THE PLIER DESIGN THAT OBSOLETE ALL OTHERS

CHAMPION D^oARMENT TOOL CO. • MEADVILLE, PA.

Reason: the extra weight of convertiplanes will cut their payload beyond economic sense, he believes. A 12-ton convertiplane, for instance, could carry about 10 people or a ton of cargo—against 20 people or two tons for a helicopter of like size.

Convertiplane enthusiasts counter by disputing this loss of pay load and talk, instead, of forward speed, the ability to sit down anyplace and increased efficiency in larger models. It's the ideal military craft for tight sit-downs and fast getaways, they claim. And for airline routes under 600 miles, it can handle intercity traffic more speedily and efficiently than big planes, by picking up and delivering passengers from rooftop to rooftop, right in downtown areas.

Whether you want them, or not, convertiplanes are coming — experimental ones, at any rate. And if you don't like the ones you see there are plenty more on the drawing boards—including what Mr. Wilford calls "the ascenders." These designs, some of them proposed recently by General Electric, sit on their tails on the ground. Huge rotors on the nose pull them into the air, where they promptly turn and fly horizontally. In some, the lift props become wings and they're propelled by jets in forward flight. In others, the rotors do all the work and sit them back on the ground tail-first at the end of the flight. Most are patterned after a rocketlike Focke-Wulf design with a great three-bladed rotor that whirled the entire midsection of the ship—a craft truly "out of this world." That's where many convertiplane purists think this type belongs. "They're not convertiplanes; they're propeller-driven rockets," one engineer sputters. Whatever they are, you probably won't see many until a long while after some of the little fellows have tried their wings. ★ ★ ★

Jet-Engine Paint

Jet engines are protected from their own fiery heat by a lining of ceramic-metal paint that is applied with the scorching blaze of a special spray gun. The experimental fireproofing can be sprayed as thin as one thousandth of an inch and resists temperatures up to 3500 degrees Fahrenheit for limited periods. Afterburners, rocket parts and other high-temperature engine components may be lined with the paint to lengthen their service life and permit hotter operating temperatures. In field tests with commercial planes, the ceramic linings extended the life of exhaust systems 50 to 100 percent. The paint was developed by Ryan Aeronautical Company.

SWP HOUSE PAINT

Lasts Longer...Saves Money

It pays to be "choosy" when you select the brand of house paint to be used on your home. Whether you employ a painting contractor or not, the price difference between world-famous SWP® House Paint and house paint of ordinary quality will mean less than \$5.00 for the average-size, complete house job. This slight difference in cost pays for years of extra wear and is one of the wisest economies you can make.

In 1953, Sherwin-Williams SWP House Paint was used to paint more homes in America than any other brand. Why? Continuous research in Sherwin-Williams Testing Laboratories and in the field has insured constant improvement and the top-quality performance of SWP. You'll be money ahead when you discover there is a difference in house paints!



White and Colors That Last . . . All over the country, in all climates, Sherwin-Williams maintains test stations where house paints of every type and description are exposed to years of weather and wear. SWP white that stays whiter and SWP colors that maintain their brilliance are the direct result of this painstaking research.



FREE: For full information on SWP House Paint and lots of interior decoration ideas, too, ask your dealer for a copy of the 44-page "Home Decorator" or write to The Sherwin-Williams Co., 1266 Midland Building, Cleveland 1, Ohio.

Let us recommend a reliable painting contractor.

SHERWIN-WILLIAMS  **HOUSE PAINT**

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JUNE 1954



Tested for Your Protection . . . A most exacting procedure of quality-control testing through every step of manufacture, from raw materials to finished product, assures maximum beauty and protection in SWP House Paint. Laboratories in every Sherwin-Williams factory are charged with the responsibility of absolute quality control of every gallon produced.



Ease of Application Assured . . . Invented by Sherwin-Williams Testing Laboratories, this instrument, known as the high shear viscometer, is an extraordinary development which makes possible the scientific measurement of the brushing qualities of paint. This testing procedure has made possible the superior brushing qualities in SWP House Paint which insure remarkable ease of application.

Go to the store that displays
this famous trade-mark . . .



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Looking for Something?



FROM BOATS TO
BUILDING MATERIALS
WHATEVER YOU NEED

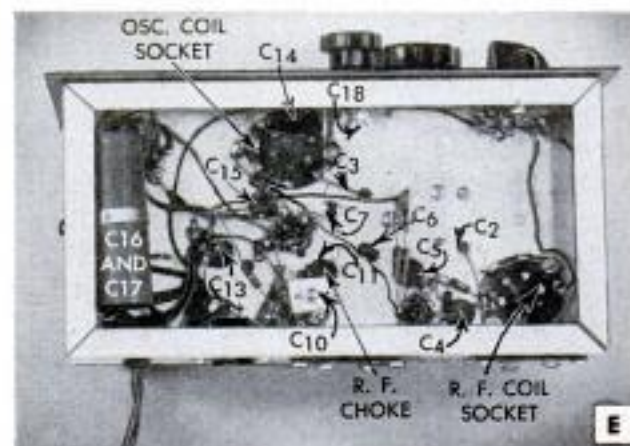
LOOK IN THE
'YELLOW PAGES'
OF YOUR TELEPHONE DIRECTORY

Short-Wave Converter for Any Broadcast Receiver

(Continued from page 143)

houses. The 2-gang variable capacitor is a B.J.W. Miller 365 mmfd. type 2112. It is a compact T.R.F. type, having trimmers (Tr.) on side of frame. Outer rotor plates are slotted for tracking adjustment. Any similar 2-gang capacitor of 10 to 365 mmfd. can be used. C18 is a 15 mmfd. band-spread capacitor.

Photo A shows the completed converter in the homemade plywood cabinet, detailed



in Fig. 1. Note that the interior of the cabinet is lined with tin foil. The steel panel and aluminum chassis base are standard sizes; see Fig. 2 for drilling details. At slightly added expense, the builder can use a metal cabinet of standard size and eliminate the necessity for tin-foil shielding. A standard hinged-cover metal cabinet 7 x 10 x 8 in. with removable front and rear panels, is listed in parts-house catalogues for \$3.84. There would be no change in the front-panel drilling details, or in the chassis base detailed in Fig. 2.

With the rotary switch in the position shown in diagram Fig. 4, the antenna is

(Continued to page 216)

F COIL-WINDING CHART SEE FIG. 3	
3 To 9 Megacycles	8 To 20 Megacycles
R. F. COIL	R. F. COIL
LARGE WINDING 17 TURNS OF No. 24 ENAMELED WIRE EQUALLY SPACED OVER 1-IN. LENGTH	LARGE WINDING 10 TURNS OF No. 22 ENAMELED WIRE EQUALLY SPACED OVER 1-IN. LENGTH
SMALL WINDING 6 TURNS OF No. 24 ENAMELED WIRE CLOSE WOUND 1/4-IN. BELOW LARGE WINDING	SMALL WINDING 4 1/2 TURNS No. 22 ENAMELED WIRE CLOSE WOUND 1/4 IN. BELOW LARGE WINDING
OSCILLATOR COIL	OSCILLATOR COIL
LARGE WINDING 14 TURNS OF No. 24 ENAMELED WIRE EQUALLY SPACED OVER 1 IN. LENGTH	LARGE WINDING 9 TURNS OF No. 22 ENAMELED WIRE EQUALLY SPACED OVER 1 IN. LENGTH
SMALL WINDING 7 TURNS OF No. 24 ENAMELED WIRE CLOSE WOUND 1/4 IN. BELOW GRID WINDING	SMALL WINDING 3 TURNS OF No. 22 ENAMELED WIRE CLOSE WOUND 1/4 IN. BELOW GRID WINDING
ALL COILS WOUND IN SAME DIRECTION	ALL COILS WOUND IN SAME DIRECTION



FIRST IN THE FINEST WOODWORKING SHOPS

Rockwell-built **DELTA Unisaw**



DELTA Tenoning Attachment provides positive moving support for tallest boards; you cut tenons quickly, safely, accurately. Also serves as vise for all kinds of complicated cutting jobs.

A circular saw is the backbone of any shop—the first tool you use in starting a project, and the one you use most in the majority of things you make. That's why it should be the very *best* saw you can get: the Delta 10" Tilting Arbor Unisaw, first choice for the *finest* home shops, and for industrial woodworking plants, too!

From its perfectly true, massive table (you can cut to the center of a 50" panel) to its sturdy cabinet base, the Delta Unisaw is a rugged, precision machine. Controls are convenient, simple. Everything about

it is designed and built to make it the most accurate, smoothest-running, safest, saw you've ever seen. And with Delta Accessories for shaping, dadoing and tenoning, your Unisaw becomes even more versatile.

No other saw combines all of the extra-quality features that make the 10" Unisaw an unmatched lifetime value. See it at your Delta Dealer's. He's listed in your classified phone book under "Tools". And be sure to see the Delta Homecraft saws, too—finest in their price class.

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GRADUATE TO A...

Graphic



A fraction of a second too soon . . . a fraction too late . . . and a great sports picture is lost. Press photographers really need cameras they can count on, and that's the big reason why 93.9% of America's press photographers shoot with Pacemaker Graphics. Rugged Graphics can take a terrific beating and still deliver

crystal-clear action shots or studio quality portraits. And they give you the large pictures editors prefer. Have your Graflex dealer show you both the Pacemaker Speed and Pacemaker Crown Graphics—each in three sizes. And see the Century Graphic, now only \$122.50 with f/4.5 lens.

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Here's everything you need to start earning money in your spare time, and you can own a Graphic Press Outfit for as little as \$29 down! Complete outfit includes Pacemaker Graphic with lens and shutter of your choice—plus a sheet film holder; coupled rangefinder (installed); and a Graflite Flash with connecting cord. Ask your dealer about time payments.

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Price-Winning Camera



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CAPACITORS

- C1—.0002 MFD. DISK CERAMIC
- C2 AND C3—365 MMFD. 2-GANG VARIABLE CAPACITOR WITH TRIMMERS; J. W. MILLER, TYPE 2112
- C4—.005 MFD. DISK CERAMIC
- C5—.005 MFD. DISK CERAMIC
- C6—100 MMFD. TUBULAR CERAMIC
- C7—25 MMFD. TUBULAR CERAMIC
- C8—.005 MFD. DISK CERAMIC
- C9—100 MMFD. TUBULAR CERAMIC
- C10—70-480 MMFD MICA TRIMMER
- C11—.005 MFD. DISK CERAMIC
- C12—100 MMFD. TUBULAR CERAMIC
- C13—.005 MFD. DISK CERAMIC
- C14—.00018 MFD. DISK CERAMIC
- C15—ONE .0005 MFD. AND ONE .00025 MFD. DISK CERAMIC (10%) TYPES (IN PARALLEL FOR 750 MMFD.)
- NOTE—ALL DISK CERAMICS AND TUBULAR CERAMICS ARE CENTRALAB (HI-KAPS)
- C16 AND C17—DUAL-SECTION 20-20 MFD. 450-V., ELECTROLYTIC CAPACITOR UNIT, MALLORY TYPE BBRD; C18—15 MMFD VARIABLE

connected to the primary (small) winding of the antenna (r.f.) coil. Although a short antenna of 10 to 15 ft. will give good results, an outdoor antenna of standard length will give best results on both short-wave and standard-broadcast reception. The secondary (large) winding is tuned by variable capacitor (C2) to the desired frequency. The signal is then applied to the grid of the first 6BA6 tube. The 6BE6 tube serves both as an oscillator and mixer. The third stage, 6BA6 tube, of the converter is the intermediate-frequency amplifier. Coupling from the converter to the radio is through capacitor (C12). It is connected from the plate of the i.f. amplifier to the output terminal. It is merely necessary to run a piece of wire from the output terminal of the converter to the antenna input of the radio set and tune set to 1500 kc.

Photos B, D and E show various views of the completed chassis base. In wiring, the most important point to remember is that all leads must be as short and direct as possible. Proper adjustment of the converter can be made with either a signal generator providing frequencies up to 20 megacycles, or a grid-dip meter covering the same frequency range. Follow the usual alignment procedure. When operating the converter as in sketch C, tuning should be done with the main tuning capacitor. The band-spread capacitor (C18) should be half open, while the main tuning capacitor is rotated in search of a station; several stations may be heard with a small rotation of this C2 and C3 dial. These stations are then spread out for easy tuning with the band-spread capacitor C18. Detailed student material list R-426 is available from Popular Mechanics Radio-TV and Electronics department upon receipt of ordinary letter postage. ★ ★ ★



Hydraulics—Hard-Working Farm Hand

(Continued from page 137)

"This lift is equipped with a bucket manure loader of the usual type. I build fences by using the bucket as a platform to stand on while driving posts. Weights in the bucket make it into a good pile driver. We can easily lift heavy pieces of machinery and transport them to our shop for repairs. It puts a second story on my hog barn because it makes it easy to lift feeds and other things to the attic for storage. With a blade in place of the bucket we use it to keep our roads open during winter and for grading and spreading gravel."

One development in hydraulic tractor lifts is a commercial fork-lift unit that fits the rear of a Ford tractor. Fruit raisers such as Don Wood of Kingsburg, Calif., find this lift an excellent means of bringing boxes of fruit out of the orchards. The lugs are placed on pallets, the tractor lift picks up the pallet load and brings it out of the orchard and places it on a truck ready for transportation to the cannery.

"This method of operation is a timesaver for the orchardist," Wood says. "It does away with loading of sleds, trailers or trucks in the orchard a box at a time, then transferring a box at a time to a transport truck. I was able to cut two men from my orchard crew and my cost of hauling the crop from orchard to the cannery fell from \$2.50 to 97 cents per ton. Just one small hydraulic unit accomplished this."

Cattlemen are finding an excellent use for hydraulics in a number of ways. One is in the dumping of feed from the side of trailers or wagons into driers and choppers. Two hydraulic rams, one set at each end of the bed and to one side, are powered either from the vehicle pulling the trailer or from a hydraulic pump at the receiving hopper.

Cattle operating tables are also powered by hydraulic rams. "There's nothing like it," Charles Summers of Hutchinson, Kans., says. "You just can't handle the doctoring of cattle from a chute. You need a table and you can't lift an animal onto a table, but hydraulics does it."

The animal is placed against the table top while it is in a vertical position and fastened with ropes. Hydraulic power then tilts the table up to a horizontal working position.

Clarence Kuelner of Palouse, Wash., takes advantage of hydraulic power to make a triple-duty machine. His tractor carries two or three attachments everywhere he

(Continued to page 220)

wet basement?

DURA-DRI it!

CEMENT COATING

Now it's easy to dry up and brighten up a damp, dark basement with new DURA-DRI. You just apply this heavy bodied protective coating with a brush, right over any porous masonry. It actually becomes a part of the surface—controls water penetration . . . decorates in any one of four beautiful pastel colors.



DURA-STOP

COMPOUND — fills holes and cracks through which water flows

Use this new hydraulic cement when necessary, prior to the application of DURA-DRI. It sets in just three to five minutes; actually stops the flow of water.

For further information on these two TEXOLITE* paint products, see your TEXOLITE paint dealer, or write Dept. PM 6, 300 West Adams St., Chicago 6, Illinois. *T. M. Reg. U. S. Pat. Off.

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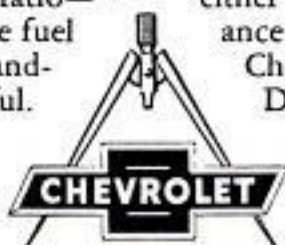


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Inhale—Squeeze—Burn—Exhale. That's what's done to the fuel mixture in the cylinders of your engine hundreds of times every second you drive. On the efficiency of this cycle depends the amount of power your engine develops and the amount of gasoline consumed in developing it. The famous efficiency of Chevrolet engines is the result of forty years of progress in valve-in-head design. Valve-in-head engines are more efficient because they draw more fuel mixture into the cylinders, retain more power-producing heat, and expel fumes more thoroughly and quickly. With Chevrolet's 7.5 to 1 compression ratio—highest in leading low-priced cars—the fuel is squeezed harder and the push of expanding gases on the pistons is more powerful.

Chevrolet's dual automatic spark advance provides for ignition of the fuel precisely when it is required, and scientifically shaped combustion chambers assure smooth, knock-free burning—even with standard gasoline—with a blue flame that indicates complete combustion of the fuel. With Chevrolet engines, you get exceptional power for an extremely low operating cost. The "Blue Flame 115," used in gearshift models, develops 115 h.p. The "Blue Flame 125" teamed with Powerglide as an extra-cost option, develops 125 h.p. See your Chevrolet dealer. Try a Chevrolet with either engine. You'll like its fine performance and money-saving gas mileage. . . .
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OIL FILTERS • CARTRIDGES

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goes. Most of the year there is a mower at the side, a duster boom at the rear and a spray boom at the front. The latter two are raised and lowered by hydraulic power. The spray boom can be taken off and replaced by a manure lifter or a scraper to make two more units that can be controlled by hydraulics.

Donald Paul of Delaware, Ohio, uses the hydraulic ram to lift the front end of trailers so their contents such as corn, chopped hay and grains will slide out the rear. It beats forking or shoveling.

Lester Lederer of Willows, Calif., handles grain from his harvester via a bulk truck which transports storage tanks. This truck is constructed with a side motor allowing grain to be unloaded by a belt powered to the front, giving easy and full view to the operator so he can watch from his seat the flow of grain from the truck into the elevator hopper. Louvered gates in the bed of the truck control the flow of grain onto the belt. Two 12-inch hydraulic rams open and close the gates, giving complete unloading control from the driver's seat.

The cotton grower has found the application of hydraulics to his equipment a major advantage. When applying defoliating materials the wheels of the spray machine must have shields on them to push aside the plants so they will not be run over. These shields must be raised and lowered in and out of rows and while traveling away from the field. Hydraulics have made this possible. Spray booms are also adjusted by hydraulics to the contour of the land.

The Washington State Apple Commission, whose task it is to develop methods of easing the apple-grower's task and cut down operational costs, have taken the lift out of one apple-handling job. They developed a lift for stacking boxes of apples in high piles. This vertical piler is raised and lowered by a hydraulic pump turned by a starter motor and battery.

Even in the snow country the hydraulic principle is put to work clearing roads and chore paths on ranches. Milvoy Vilets of Toledo, Iowa, places a heavy plank "V" plow on the front of his tractor. The plow is lifted and lowered by hydraulic lifts on each side of the engine.

There is no phase of farming, even the farm shop, where the farmer isn't finding that hydraulic power is his ideal handy man for putting money in his pocket. It does work easier and faster than human farm hands, requiring less man-hours and hired help to do a job, and saves the wear and tear on the farmer himself by eliminating the task of hand lifting, pulling and pushing.

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IS
YOU!



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Accessories: 7 Twist Drills • 3 Auger Bits • Countersink • 1/4-inch Masonry Bit • Paint Mixer • Wire Wheel Brush • Wheel Arbor • Wire Cup Brush • 3-inch Grinding Wheel • Molded Rubber Pad • 3 Sanding Discs • Polishing Bonnet • Can of Electric Wax.



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Owners Praise Buick Styling And Wrap-Around Windshield

(Continued from page 110)

"Neat added attraction. Should be a difference between the Super, Special and Century in reference to the three holes."—Houston, Tex., timekeeper.

"Not properly sealed. Mud from wheels leaks through plastic stoppers and runs down fenders."—Independence, Kans., electrician.

"Children stick dirt into the portholes and make them a garbage dump."—Brooklyn, N. Y., distributor.

Another feature that is more interesting than important is the new Redliner speedometer, standard on Super and Roadmaster models. This speedometer has no needle. Instead, a red line moves horizontally across the face of the dial to show miles per hour.

The vast majority liked this feature—90 percent, to be exact. The 10 percent who disliked it complained that it was noisy and some said the horn ring blocked vision of the horizontal speed indicator.

"Makes a noise. When I have the seat adjusted for comfort, horn ring cuts out the red line from 50 on up."—Brush, Colo., farmer.

"Makes you realize the speed more than you do with needle type."—Opelousas, La., oil worker.

No Excessive Oil Consumption

When we conducted an Owners Report on the 1953 Buick with its new V8 engine there were many complaints of excessive oil consumption. At that time Buick stated it was changing to new piston rings to correct this trouble. Apparently, the oil problem has been solved. Very few owners reported unusual oil consumption this year. See the Percentage Table for the figures on this.

A whopping 95 percent of the owners responding have Dynaflo and most of them love it.

"Twin-turbine Dynaflo is smoothest yet. No jerk and the power of the new Century is terrific. Surplus power adds to safety in passing cars on hills."—Denver, Colo., salesman.

"Great improvement over old single-turbine Dynaflo."—West Hartford, Conn., dentist.

In the three important departments of roadability, handling and structural rigidity, the new Buick stood up well in all except the last. Many owners are dissatisfied with its structural rigidity and most

(Continued to page 224)



Compatible color TV will eventually reach every TV home.

The rainbow you can see in black and white!

**RCA brings you compatible color TV.
Lets you see color programs in black
and white on the set you now own!**

"When a modern, practical color television system for the home is here, RCA will have it . . ."

These words—spoken in 1946 by David Sarnoff, Chairman of the Board of RCA—have a ring of triumph today.

The day on which the FCC approved standards for the commercial broadcasting of *compatible color television*—December 17, 1953—will be remembered in the annals of communications along with the historic date of April 30, 1939, when RCA-NBC introduced *black-and-white television*.

At that time sight was added to sound. Now color has been added to sight.

RCA scientists were engaged in research basically related to *color television* as far back as the 1920's . . . even before *black-and-white television* service was introduced.

Since then RCA has spent over \$25,000,000 to add the reality of color to black-and-white TV, including development of the tri-color tube.

The fruit of this great investment is the RCA all-electronic compatible color television system, *a system that provides for the telecasting of high-quality color pictures that can be received in full color on color receivers; and in black and white on the set you now own.*

Although it will probably be another year before mass production is reached, the promise of compatible color TV is being fulfilled.

RCA pioneered and developed compatible color television



RADIO CORPORATION OF AMERICA

World leader in Radio—first in television

of them own the Specials and Centurys which use the lighter body and chassis.

Owner Loyalty Is High

It is interesting to see how owner loyalty increases as the series becomes more expensive. Top owner loyalty is among Roadmaster owners, 93 percent of whom have owned a Buick before (30 percent have owned at least 5 Buicks). Lowest is among Special owners with 65 percent being previous owners (9 percent have owned at least 5 before).

The same pattern is apparent in answers to the question "Would you buy another Buick?" Not a single Roadmaster owner said no and 95 percent said they definitely would with the other 5 percent being undecided. Four percent of the Special owners said they would not buy another and 64 percent gave an unqualified yes (see the Percentage Table).

Miscellaneous Complaints

The following are quotations describing complaints of various owners. While few of these are mentioned by more than a small percentage of owners they are interesting enough to be included in this report.

"Very poor paint job. Icelike cracks all over the white paint. Looks brittle."—Arlington Heights, Ill., businessman.

"Some engine ping on rapid acceleration. Could use 100-octane gas in my Super if obtainable."—St. Louis, Mo., dentist.

"Ventilation intake is not functional when covered with snow and therefore defrosters do not work when needed."—Marion, N. C., truck-line manager.

"Rear-seat depth short. Rear-seat floor space small with front seat all the way back on my Special four-door sedan."—So. Charleston, W. Va., factory representative.

"Empty right-front seat has unwanted
(Continued to page 226)

1954 BUICK SPECIFICATIONS

ENGINE

	Special	Century	Super	Roadmaster
Type	8-cyl., V-type, OHV	8-cyl., V-type, OHV	8-cyl., V-type, OHV	8-cyl., V-type, OHV
Bore and stroke	3.625x3.20 in.	4.00x3.20	4.00x3.20 in.	4.00x3.20 in.
Piston displacement	264.0 cu. in.	322.0 cu. in.	322.0 cu. in.	322.0 cu. in.
Brake horsepower	143 @ 4200 r.p.m. Conv.	185 @ 4100 r.p.m. Conv.	177 @ 4100 Conv.	200 @ 4100 r.p.m.
Compression ratio	7.2 to 1 Conv. 8.1 to 1 Dyn.	200 @ 4100 r.p.m. Dyn. 8.0 to 1 Conv. 8.5 to 1 Dyn.	182 @ 4100 Dyn. 8.0 to 1 Conv. 8.5 to 1 Dyn.	8.0 to 1
Transmissions	3-speed conventional Torque converter with gears optional.	3-speed conventional Torque converter with gears optional.	3-speed conventional Torque converter with gears optional.	Torque converter with gears standard.

GENERAL

Steering ratio	26.7:1	26.7:1	26.7:1	24.1:1
Steering wheel	5 turns	5 turns	5.0 turns	4.5 turns
Turning radius	20 ft. 9.6 in.	20 ft. 9.6 in.	21 ft. 6 in.	21 ft. 6 in.
Brakes	Conventional hydraulic	Conventional hydraulic	Conventional hydraulic	Conventional hydraulic
Tire size	7.60x15	7.60x15	7.60x15	7.60x15
Recommended tire pressure	24 lb.	24 lb.	24 lb.	24 lb.
Shipping weight (4-dr.)	3735 lb.	3805 lb.	4105 lb.	4250 lb.
Wheelbase	122 in.	122 in.	127 in.	127 in.
Tread, front	59 in.	59 in.	59 in.	59 in.
Tread, rear	59 in.	59 in.	62.2 in.	62.2 in.
Height over-all	62.3 in.	62.3 in.	64.2 in.	64.4 in.
Width over-all	76.6 in.	76.6 in.	79.8 in.	79.8 in.
Length over-all	206.3 in.	206.3 in.	216.8 in.	216.8 in.
Road clearance	6.5 in.	6.5 in.	6.5 in.	6.7 in.

CAPACITIES

Oil	6 qt.	6 qt.	6 qt.	6 qt.
Water	16.5 qt.	16.5 qt.	16.5 qt.	16.5 qt.
Gasoline	19 gal.	19 gal.	19 gal.	19 gal.

INTERIOR DIMENSIONS

Front-seat width	62.5 in.	62.5 in.	64.9 in.	64.7 in.
Rear-seat width	62.8 in.	62.4 in.	65.7 in.	65.7 in.
Headroom, front	35.6 in.	35.6 in.	36.6 in.	35.9 in.
Headroom, rear	34.0 in.	34.0 in.	35.2 in.	35.1 in.
Legroom, front	42.3 in.	42.3 in.	43.3 in.	43.4 in.
Legroom, rear	40.9 in.	41.4 in.	45.2 in.	45.6 in.

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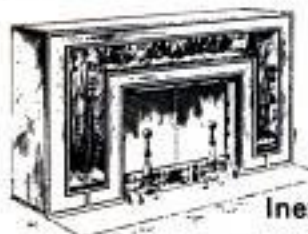
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O. doesn't believe in feeding plant foods. Just push a few seeds in the ground and let nature take its course, that's O.'s theory. 'Course he does help things along with a few tons of black dirt now and then. Slightly irritating to O. is the fact that his wife's half of the garden, fed Vigoro® regularly, is doing much better than his!

O. might have a good case—if nature provided us with perfect growing soils.

But few soils are perfect. Most of our garden soils consist of sub-soils, imported top soil of unknown quality, or sandy soils which nature never did endow with ample plant food.

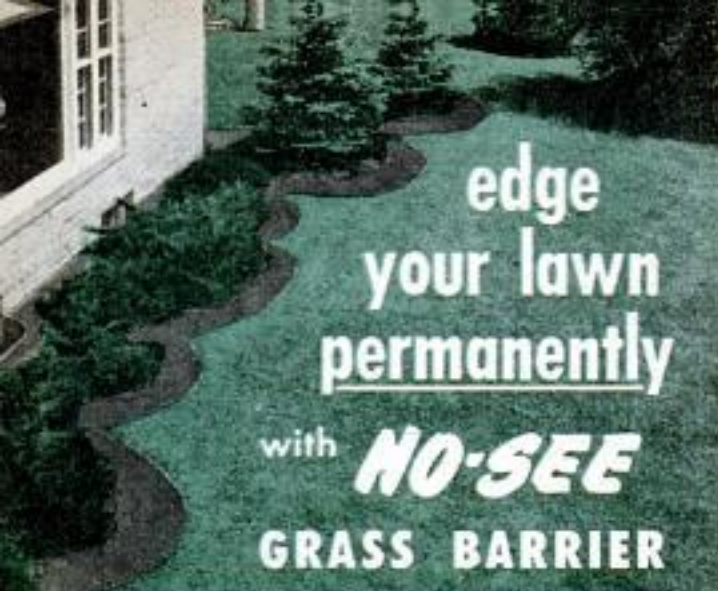
That's the beauty of Vigoro. For regardless of what kind of soil you have, or import, Vigoro can make it rich in all nutrients needed for the very best grass and other plant growth and development. And economically.

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permanently
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GRASS BARRIER



**STOPS GRASS
HERE!**

Underground "fence" keeps grass in its place. Stops bluegrass (including new Merion), quack grass, Bermuda, St. Augustine, Bent and others from spreading into cultivated areas. Install NO-SEE around trees, shrubs, foundation plantings, flower beds; along fences, hedges and driveways. Mow right over it, trimming edge neatly. Gives your lawn that well-cared-for look with half the labor.

NO-SEE is made of corrugated, galvanized steel. Sections two feet long by 4 inches deep key together with special clips. Easy to install; just drive down to soil level. Bends around corners; follows contour of soil.

Eliminates grass trimming and edging



BEFORE—Mower leaves grass and weeds around trees. Hand trimming is necessary.

AFTER—Trim as you mow! With one wheel in cultivated area, you trim edges neatly.

If your local hardware, nursery, garden or department store cannot supply you, order direct from one of the following:

- Brook's Boston, Massachusetts
- Farmer Seed & Nursery Faribault, Minnesota
- Drumcliff Co., Dept. S.E. Towson 4, Maryland
- Montgomery Ward & Co. [All mail order houses]
- Security Feed & Seed Co. Greenville, S. Carolina
- Western Seed Co. 1425 15th St., Denver 2, Colo.
- Templin-Bradley Co. 5700 Detroit, Cleveland, Ohio
- Hallowell Seed Co. 519 Market St., San Francisco 5, Calif.
- Vannegut Hardware 402 W. Maryland, Indianapolis 9, Ind.
- F. W. Belgiano 411 New York Ave. N.E., Washington 2, D.C.
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shake on two-door model."—Brookville, Ohio, engineer.

"Front floor mats fit very badly."—Lewiston, Idaho, paper worker.

"We just can't get those gadgets on the ventilation system adjusted. We get a cold breeze on our feet."—Dubuque, Iowa, dairyman.

"Windows too difficult to raise. My wife uses two hands to open a window. Ash trays do not open far enough."—Gainesville, Fla., telephone worker.

"Glove compartment small."—Columbia Falls, Mont., construction man.

"Do not like where front cigarette lighter is placed. Too easy for children to break it."—Kasson, Minn., retailer.

"Rear springs too light when four or five good-sized persons are in the car, especially if carrying much luggage."—Unity, Me., businessman.

"Instruments on dash could be more visible."—Hartford, Conn., advertising man.

Over-All Rating is High

Although these complaints are a fair sampling of the owners opinions, over-all the 1954 Buick rates high indeed with the owners. Only one percent of the Super owners rated their cars as poor over-all. The other three series had no owners listing their cars as poor. All but a very small percentage described the cars as either excellent or good.

Another indication of how the new Buick stacks up with owners is the percentage of owners listing no complaints at all. Here are those figures: Special owners, 33%; Century owners, 38%; Super owners, 39%; and Roadmaster owners, 35%.

Clymer's Road Test

The test car, a Dynaflow-equipped Century four-door, was driven from the factory at Flint, Mich., via Kansas City, Mo., to Denver, Colo.—a distance of 1578 miles.

The Century, priced \$250 above the lowest-priced Special, is a powerhouse on wheels. Its amazing performance results from a high power (200 horsepower) to weight (3786 pounds) ratio. The Century engine is the same as used in the Roadmaster; the body and chassis are the same as in the Special.

The test model (with power steering) had good roadability and cornered well, considering the soft front springing which Buick uses (like other domestic manufacturers). There is some roll on the corners. The new shock absorbers inside the front spring coils improve control. Acceleration and power for quick passing are great. In a supplementary test I ran in California, a

(Continued to page 228)

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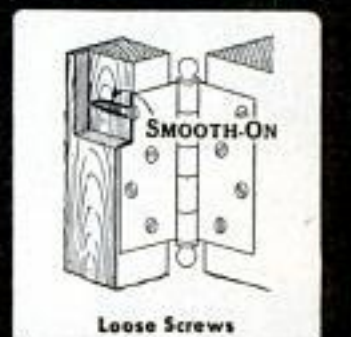
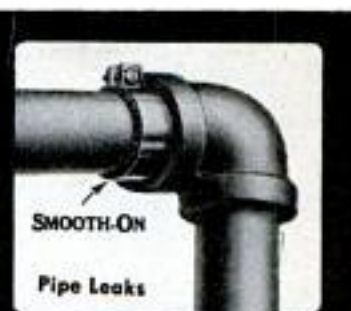
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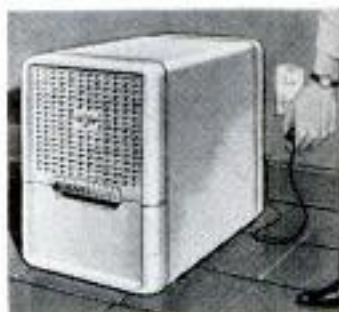
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CITY _____ ZONE _____ STATE _____

Century topped my favorite test hill at 30 miles per hour in low. That is faster than any other car I've tested—and I've tested them all on this particular hill.

Torque multiplication of Dynaflow is quick and smooth. There is no jerk. The Century engine can spin the wheels on dry pavement. Dynaflow is certainly the smoothest automatic transmission and, when properly handled, I found gasoline consumption with it practically equal to that of unit using a rigid lockup at highway speeds.

The Century is one of the three fastest American stock cars. On long open stretches it cruises easily at 100 miles per hour. Top speed was 114 miles per hour by speedometer (fast by about 8 percent).

Buick sticks to its torque-tube drive in which the thrust of the rear wheels is transmitted directly to the frame of the car. This differs from the Hotchkiss drive which transmits power to the rear wheels through the rear springs. I have never been sold on torque-tube drive because the unsprung weight of the torque tube is noticeable in high-speed cornering and over rough roads where the rear end does a little hopping. It can be felt through a slight steering-wheel vibration at some speeds.

Buick retains coil springs in the rear and there is a tendency for them to bottom on hard bumps when the car is loaded.

The wrap-around windshield increases forward visibility. At first I did not like the rather awkward extension of the windshield frame back into the front doors. However, after a few hours of driving I became thoroughly sold on it. The hood is rather high in front and should be more sloping for better vision directly in front. Rear vision is also good and the high rear fenders are excellent guides when parking.

I drove over many rough roads and no squeaks or rattles developed. I was in heavy rain and no water leaks developed. I drove through a terrific dust storm in Kansas with dust so thick a group of cars, using headlights, had to creep along at 30 miles per hour. Despite a high wind, very little dust entered the car, which indicates a tight-fitting body.

There are three things I do not like about the new dashboard:

1: The top half of the horn ring is annoying. It is in line of instrument vision. If I owned a Buick I would use a hacksaw to remove this useless upper half.

2. The heater and ventilating system are good but operation of the controls is too complicated and should be simplified.

3. The cigarette lighter protrudes dangerously from the dash and should be

(Continued to page 238)



dreamship on a budget ...million-dollar fun!



BIG TWIN
25 O.B.C.
certified
brake H.P. at
4000 R.P.M.

You've dreamed of the day! And now it's here... the wonderful day when you can skipper your own eat-aboard, sleep-aboard *live-aboard* cruiser... swift, able, comfortable! Your cruising range is America-wide. Roam the waters close to home, or trailer your craft to far-away shores. Cost-wise the news couldn't be better! From inexpensive kit boat to ready-to-go cruiser you can buy in various stages of construction to suit any budget.

For power, one choice—it's **BIG TWIN**, the motor that made outboard cruising not only practical, but tops in cruising fun! 25 eager horsepower for speeds to 20 miles on light cruisers—up to 30 miles with twin motors. And now with finger touch *electric starting* if you wish, with complete remote control at steering position for'd—starter, choke, throttle, gearshift—finger tip handling ease!

SEE YOUR EVINRUDE DEALER—look for his name under "Outboard Motors" in the yellow pages of your phone book. For complete catalog and Evinrude "How-to" Book of Outboard Cruising, write EVINRUDE MOTORS, 4414 N. 27th Street, Milwaukee 16, Wis.

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3
Wizard De-Sludge-Er oil filter cartridge has new filter agent of 100% cellulose. Out-filters either paper or cotton. Removes sludge-forming elements from oil. Won't clog channel or by-pass. For all cars, trucks, tractors with full-flow or by-pass systems. Chev. 1937-53 (R35814)\$1.59

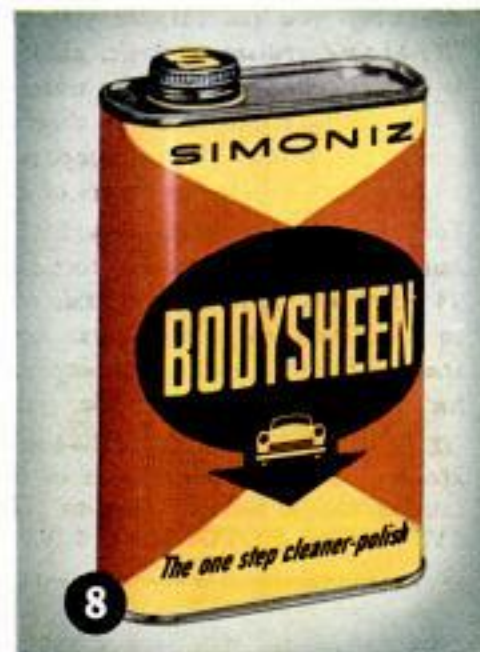


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Over 40 Years...Headquarters



7
Gleaming chrome exhaust deflectors and extensions give long-lasting beauty to your car. Keeps exhaust off bumper. Easy to attach and styled to fit your car. Western's Exhaust Deflector. Simple, flared design. (CR2806) 49c Exhaust Extension. (8" x 2 1/2") Straight-tube type. (CR2807) \$1.09



8
The one-step cleaner-polish! New Simoniz Bodysheen cleans and polishes, in one easy simple step. Wipe Bodysheen on, then wipe it off and see your car gleam. Brings out natural brilliance, enriches colors. Gives your car a tough, long-lasting, weather-resistant finish. (377113)98c



9
Here's the quick easy way to replace brakes—Stop-Rite lined brake shoes, ready to slip right into drum. Wire-backed lining permanently bonded to shoe for positive "non-grab" braking, long quiet service. Trade-in allowance. All popular cars. Front or rear, as low as\$3.75 (each.)

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4

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5

Bright, new arm rest covers snap on quickly, without removing the arm rests. Made of beautiful quilted Vinyl plastic. Choice of 5 popular colors — yellow, gray, blue, green or red—to harmonize with any seat cover or interior trim. Attractive pin-point Vinyl trim. Pr. (2N2899-2913) ... **\$1.59**



6

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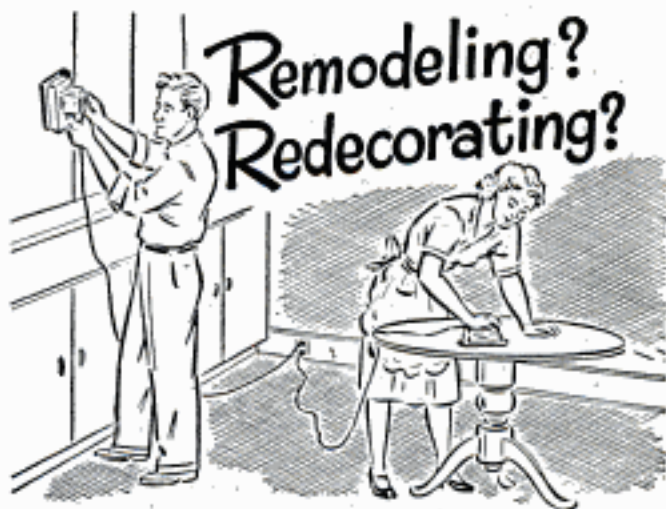
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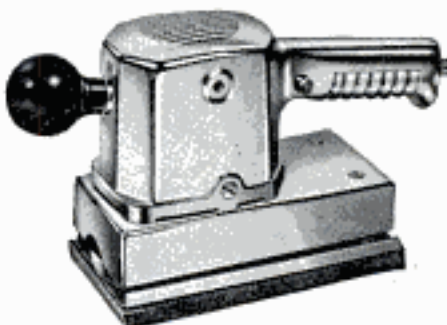
For the finest finish sanding, take a tip from the professional craftsmen—insist on Dremel Straight-Line Action Sanders. They save you money when you buy them. They save time, labor, and expense when you use them. And they're guaranteed to produce finer finishes because straight-line action sands with-the-grain—prevents cross-grain scratches and orbital swirls. Hobbyist, jack-of-all work, or professional—there's a Dremel Sander for your needs.

Of the four common sanding actions, only Dremel sands 100% with-the-grain — the only guaranteed scratch-free action approved by finishing experts.



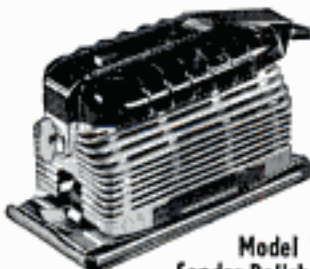
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This new sander is a real powerhouse, a professional tool kit at a handyman's price. The first ROTARY MOTOR (AC) sander of its kind to have straight line action. Weighs only 5 1/4 lbs., has 24 sq. in. sanding pad. Out-performs other makes selling for twice as much. Positively the best heavy-duty sander buy on the market. Complete with 2 detachable sanding pads. . . . \$34.85



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The one Shock Absorber that meets both Heavy-Duty and normal driving requirements in one unit.

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When the Giants Fell

(Continued from page 70)

1000-horsepower, single-cylinder steam engine that powered everything from the three bandsaws and the "shotgun" carriage to the automatic saw filer. Since the roar of steam and saws in the mill was deafening, the sawyers and their men relied solely on teamwork and cryptic hand signals as the logs hit the foot-wide ribbons of screaming, ripping steel. The "pony" bandsaw handled the ordinary pine, fir and spruce logs and often ran nonstop for a whole day, the new logs being caught and dogged by the carriage men without stopping. The redwood saw handled the small sequoia logs. The giant 10, 15 and 20-foot logs were another problem. In the older, smaller lumbering operations they had been split with blasting powder, but much of the brittle wood had been destroyed. The third bandsaw was a huge log splitter, the largest in the world then, which would halve and quarter the great logs so they would fit the redwood saw.

The shipping of 3,000,000 board feet of lumber a month from the isolated basin to the valley across mountains was an engineering triumph in those days of horses, wagons and stagecoaches. The first obstacle was the 1000-foot ridge that formed the walls of the basin. A cable tramway pulled trains of rail cars loaded with freshly cut lumber to the top of the ridge and then lowered them down the other side. The hoist that powered the tramway had a drum two stories high which would hold two miles of 1¼-inch cable in one layer so there would be no slippage and jerking of the cars. Even with such precautions cars heavy with the wet lumber broke loose now and then. The tramway and hoist were the only transportation to and from the basin; all day the narrow-gauge trains moved fast up and down the 20 and 30-percent grades.

At the foot of the steep incline on the other side, the outbound cars were coupled to waiting Shay locomotives which wound in and out of canyons downgrade another 1000 feet to Millwood, five miles away, where the lumber was stacked in yards until it was dry enough to float easily. Then it was ready for the final and most ingenious conveyance.

A wooden V-shaped flume had been built down the rugged canyon from Millwood to Kings River and along it to the valley and the railhead at Sanger. Its construction had been an ambitious three-year project costing \$300,000 when a skilled man made two dollars a day. This flume was 54 miles

(Continued to page 236)

Your **ELECTRIC DRILL** Trims
HEDGES — SHRUBS — GRASS
 with **ROTO-TRIM**
DRILL ATTACHMENT

FITS ANY
 1/4" DRILL

Today's Greatest
 Hedge Trimmer VALUE \$12.95
 Yours, Postpaid, for only **\$12.95** (Less Drill)

Keep your whole yard neatly tailored . . . trim hedges, shrubs, and hard-to-reach grass easily and smoothly with this new, inexpensive drill attachment. ROTO-TRIM quickly converts any 1/4" drill into an easy handling, keen-cutting Hedge Trimmer.

Quality Built throughout. Rigid steel and aluminum construction with smooth-running hardened steel gears and cam in one-piece case. Cutting blades are 10" long, of high-carbon steel, heat-treated, precision ground and designed for maximum safety and efficiency.

Easy to Use! Quickly attached to drill—flats simplify chucking. Light weight and precision balance make ROTO-TRIM much easier to handle than more expensive trimmers. Handle turns blade to any angle.

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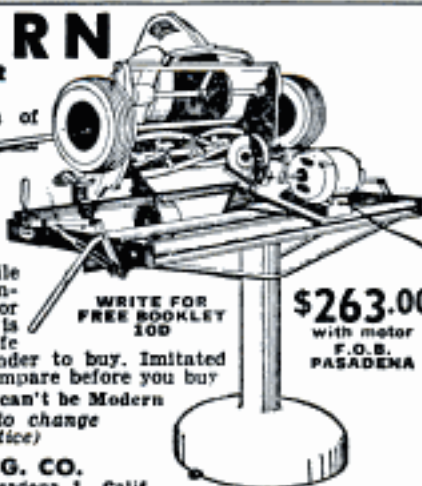
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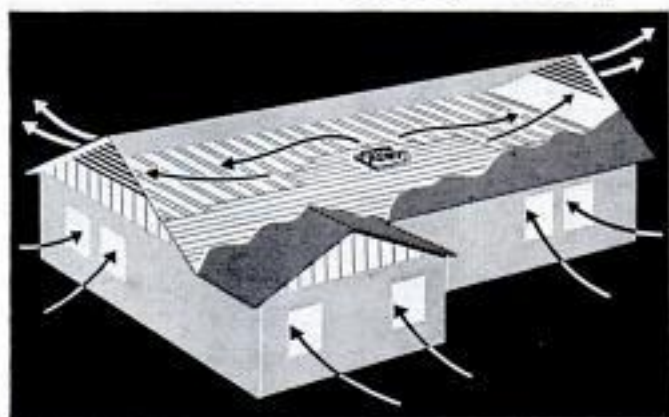


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long, mounted on trestles most of the way, and in places soared 100 feet in the air over gulches and side canyons. Made of the finest knot-free lumber, the flume itself was about 30 inches deep in the center and 36 inches wide across the top. Water from a lake was released into the flume each day. Bundles of dry lumber, clamped on either end with iron bars, were dropped into the water, tied end to end to make trains, and sent on their way to Sanger. Occasionally the lumbermen made little V-shaped flume boats and some of these old-timers can recall exciting tales of shooting the roaring water down the 70 and 80-percent drops at more than 50 miles per hour!

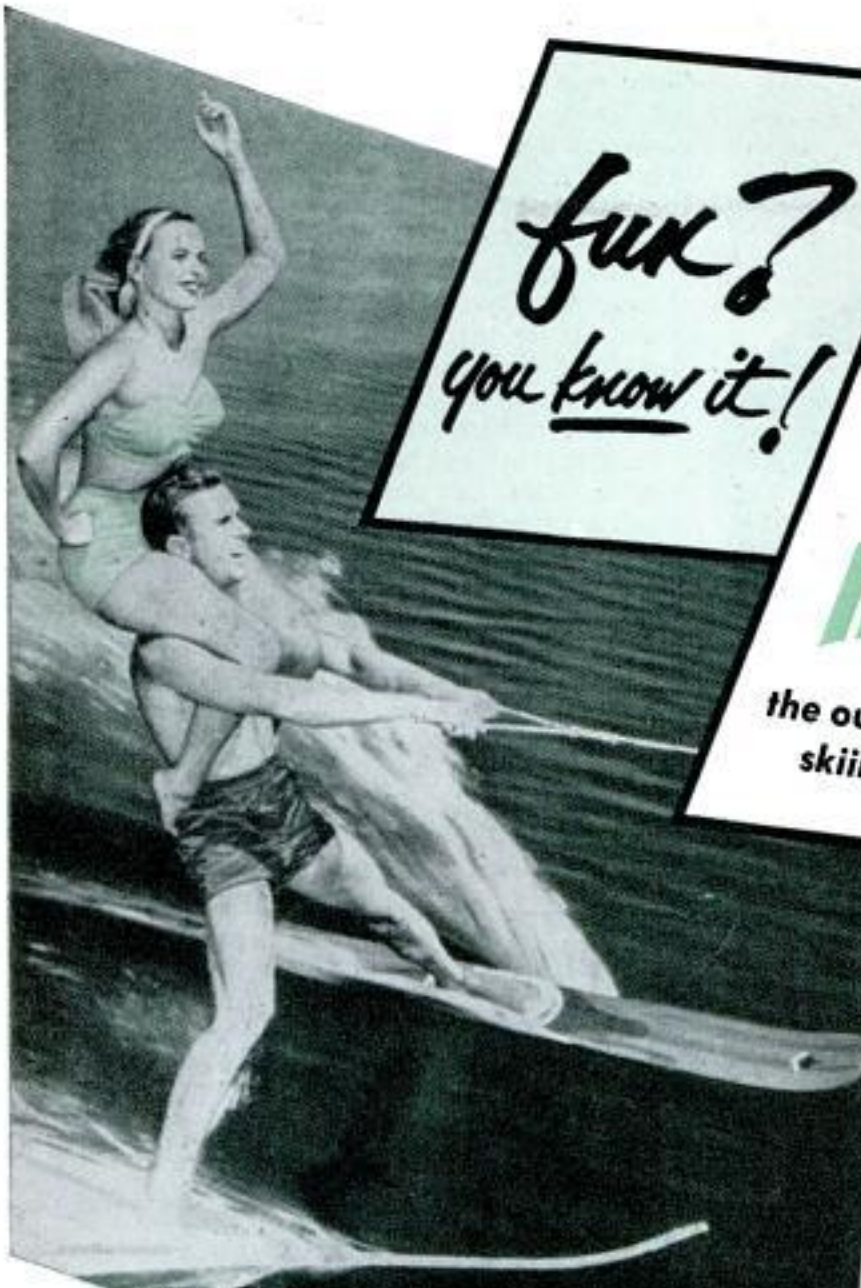
The swift aerial waterway, the mountain railroad, the tramway, the great bandsaw mill and the log chutes are all gone now, though their traces can be found in the basin and the flats at old Millwood. The massive stumps of the giant trees are certainly still there, looming like remnants of an ancient race among the young trees of the second-growth forest.

Mustaches and bustles seem to typify the 1890s and 1900s, but those years are more strongly characterized by a union of simple power mechanics and ingenuity which broke open the vast resources of the nation. And the two had no more amazing success than when the wilderness of the Sierra was broached, the sequoia giants were felled and lumbered and California ranches and homes were built of wood 2000 and 3000 years old. ★ ★ ★

Knee Dolly Eases Work at Floor Level

It's easier to work on your knees when you kneel on a low dolly equipped with casters. Padded with resilient sponge rubber and curved to fit the knee contours, it conserves energy and eliminates the cramped feeling caused by kneeling on the floor. It is handy in the home, office, garage or shop.





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the outboard that made water
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- Power—and plenty of it for skiing, for big outboard cruisers!
- Easiest starting of any large outboard because of exclusive 4 cylinder in line construction.
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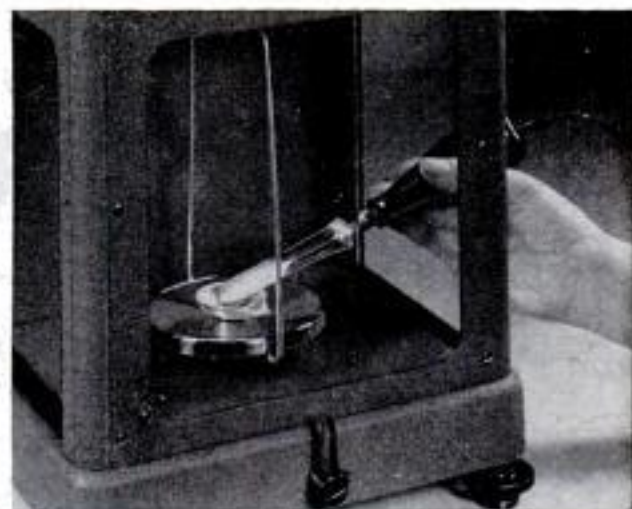
CITY _____ STATE _____

mounted higher up and near the center. If a quick stop is made, there is danger of front-seat passengers hitting it, especially children.

Buick's parking brake is left-foot operated. The driver can apply brakes with both feet at the same time in an emergency. It is a highly desirable feature.

Gasoline mileage was fairly good (see Economy Chart). I used regular gas for most of the test, although premium gas is best for the high-compression engine. I added one quart of oil in the first 800 miles which is not unusual for a new car driven at high speed and before rings are properly seated. I am not one who believes that an engine must be babied or broken in carefully for a couple of thousand miles. I drive them hard and fast after the first 200 miles.

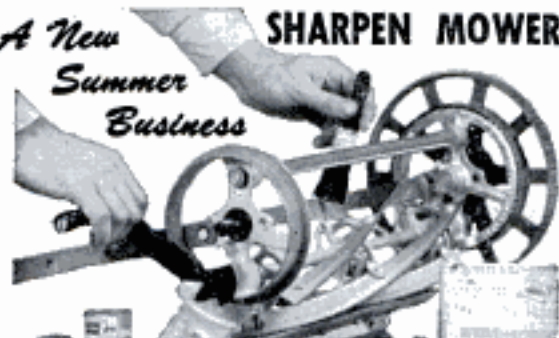
The Century is by far Buick's most spectacular performer. While some people object to increased horsepower, the Century does give a feeling of security and power when needed for getting out of traffic situations. It is desirable in accelerating and when passing other cars either on level or in hilly sections. Altogether, there are two sides to the horsepower-race question. ★★★



Vibrating Spatula Feeds Scales For Precise Measurement

Laboratory samples are fed into a weighing pan particle by particle with a vibrating spatula that aids precision measurement. A control on the motor end of the vibrating spatula varies the amount of vibration so that particles are added slowly, or in a steady stream. By tapping the control button it's possible to feed the particles in short bursts. The slight finger movement needed for the push button does not disturb the spatula balance. The unit operates on 115 volts, 50-60 cycle. A small electric motor that is encased in a handle vibrates the shaft of the spatula.

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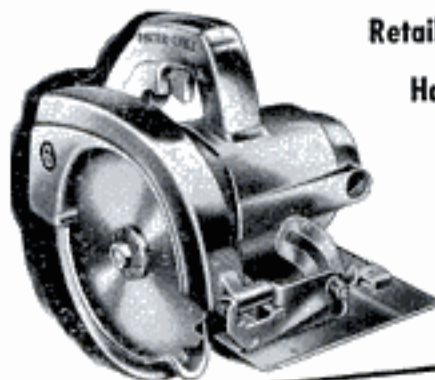


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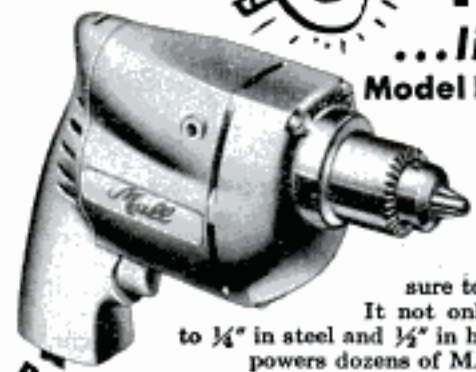
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HU-110

Is the Automatic Factory Here?

(Continued from page 90)

to handle than a maze of wires beneath a tube socket.

Henry and his staff not only designed this entirely new system of electronics, but did much of the design work on the automation machinery.

Today at the plant, steatite, a ceramic material, is poured into a hopper at one end of the assembly line. At the other end emerge complete electronic modules which can be quickly cross-connected to make radio detecting devices for the Navy, radar sets or any other electronic instrument.

Here's the way it works:

A press automatically stamps wafers out of the ceramic material at a rate of 2300 per hour. These move by machine through a tunnel-oven where they are baked for nine hours at 2300 degrees F.

Next wafers are dumped into an inspecting machine which feels each of them. The extraordinary fingers of this mechanical "inspector" reject any wafers that are .008 inch off in thickness and .003 inch off in square.

The inspected wafers move through a machine that coats each notch with silver paint. Eventually they move through a painter, where chain-driven squeegees force silver paint through a stencil and onto the wafer in the exact pattern required to print the proper circuit.

Meanwhile the capacitors have been going through a similar manufacturing line. Made of still another ceramic material, they are 1/2 inch square and only 7/100 inch thick. A circuit also is printed on these tiny wafers. Raw materials weighing only five pounds will produce 100,000 of them.

The resistor problem was solved by using an NBS concept developed several years ago. Asbestos-paper tape is sprayed with carbon black or a graphite-resin mixture. The tape is dried and slit into five or six narrow ribbons, which then become adhesive-tape resistors. All this is done by automatic machinery. A 75-foot roll of tape will make 10,000 resistors, which are automatically cemented in place on the wafers.

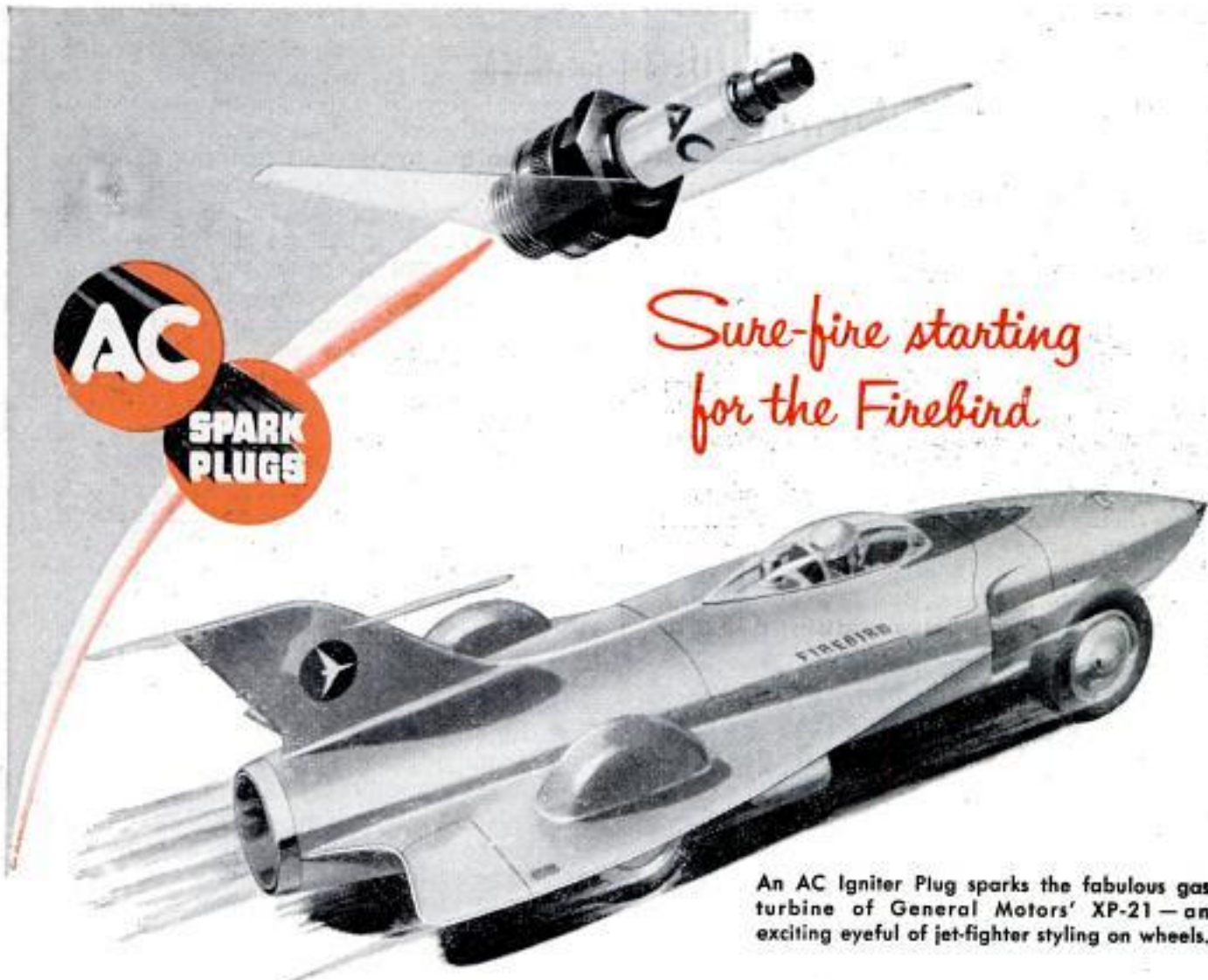
With the wafers and capacitors printed and the resistor tape made, the problem becomes one of assembly. In the final step, six vibratory feeders issue the wafers to sets of jaws which hold them precisely the right distance apart. The machine guides the wires into the notches and solders them.

All that remains is to plug a miniature tube into the top of the component. The units themselves are handled like building blocks or in the construction of new

(Continued to page 242)



*Sure-fire starting
for the Firebird*



An AC Igniter Plug sparks the fabulous gas turbine of General Motors' XP-21 — an exciting eyeful of jet-fighter styling on wheels.

A new set of AC's brings easier starting and smoother firing to any car's engine

Your car should start quickly, idle quietly, accelerate smoothly. If it isn't behaving like that, take a few minutes to have your spark plugs checked. If they're badly worn you'll find that a new set of AC Spark Plugs will go a long way toward restoring new-car performance — may give you up to 10% more power and fuel economy as much as one gallon in ten.

You see — AC Spark Plugs have many patented features that insure power-boosting, gas-saving, top-flight performance! And note: there's an AC Spark Plug engineered to General Motors standards specifically for the car *you* drive.



AC's longer, thinner insulator tip stays cleaner, boosts power, saves gas

AC's long, thin, recessed insulator tips heat up more rapidly to burn away deposits which would otherwise form at the tips to cause pre-ignition or misfiring. This is an exclusive AC feature.

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radios, radar or electronic instruments.

The National Bureau of Standards proudly showed off its brain child last fall to representatives of the electronic manufacturing industry. Manufacturers, accustomed to the hiring and training of thousands of hand workers, saw the machinery at Arlington clicking out tube assemblies by the thousands. About all the workers were doing was checking the machinery.

The manufacturers walked away from the demonstration, according to one report, "with their tubes glowing." Many already are experimenting with Tinkertoy wafers, and have indicated they eventually will produce radio and television sets by the system. This very likely will mean two things to you as a consumer: TV receivers will be less expensive because there's much less hand work on each receiver; and repairs to these new units will be less expensive. When something goes wrong with your TV set, the repairman will simply plug in a new assembly rather than hunting for the exact capacitor or resistor that is causing the trouble. This will guarantee that the entire assembly will be composed of new parts that are not likely to cause trouble for some time.

The National Bureau of Standards has no plans to manufacture electronic modules on a large scale. The little factory is simply the result of a research project which has brought automation to the electronics industry. Eventually the Bureau hopes that all radio equipment manufacturers will convert to the Tinkertoy system. Then in case of war or national emergency, every manufacturer in the country could convert to military equipment virtually overnight, simply by substituting other printed circuits on the wafers.

Authorities say there's no reason why a completely automatic factory couldn't be built, on the basis of current knowledge, to make almost any manufactured product under the sun. Such automation, though, wouldn't pay for itself. In many cases it's less expensive to hire a person to feed materials into a machine than to develop and operate an elaborate materials-handling system. Furthermore, the human can learn to change his work, while most automatic machines have little built-in versatility.

Automation can relieve drudgery and hard manual work. With its elementary-thought processes it can even direct machines and make low-level decisions.

But someone must design the machines and maintain them. Someone must design new products and change the machines to make them. Most authorities believe that automation eventually will lead to shorter hours and more interesting jobs. ★ ★ ★


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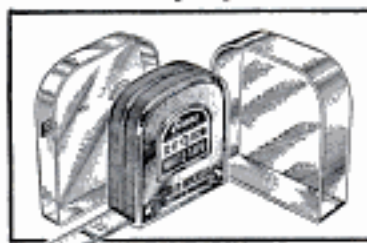
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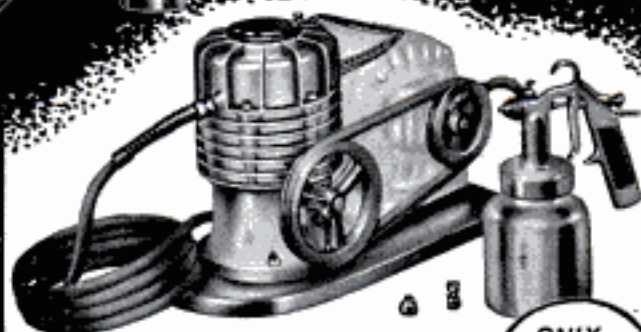
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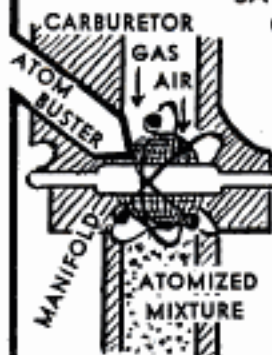
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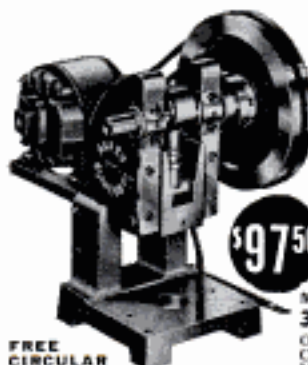


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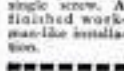
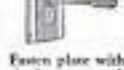
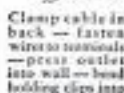
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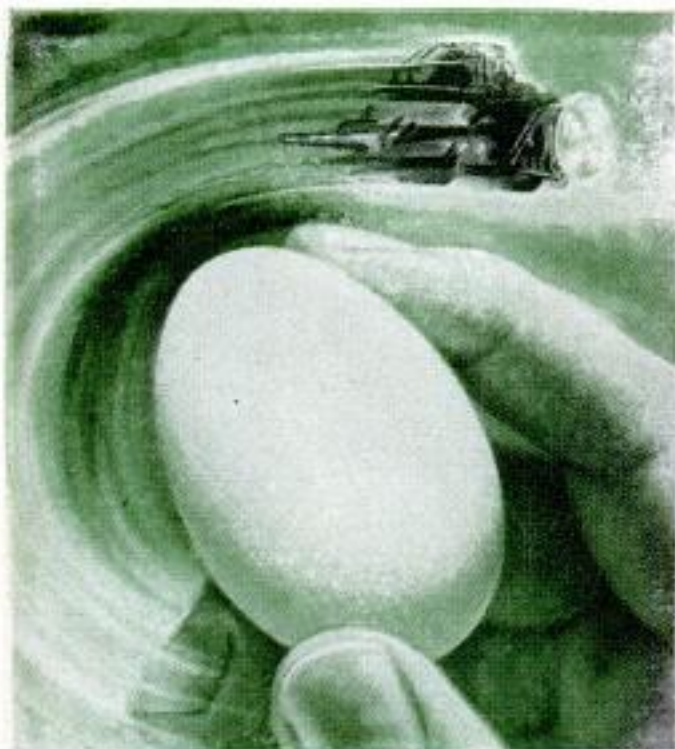
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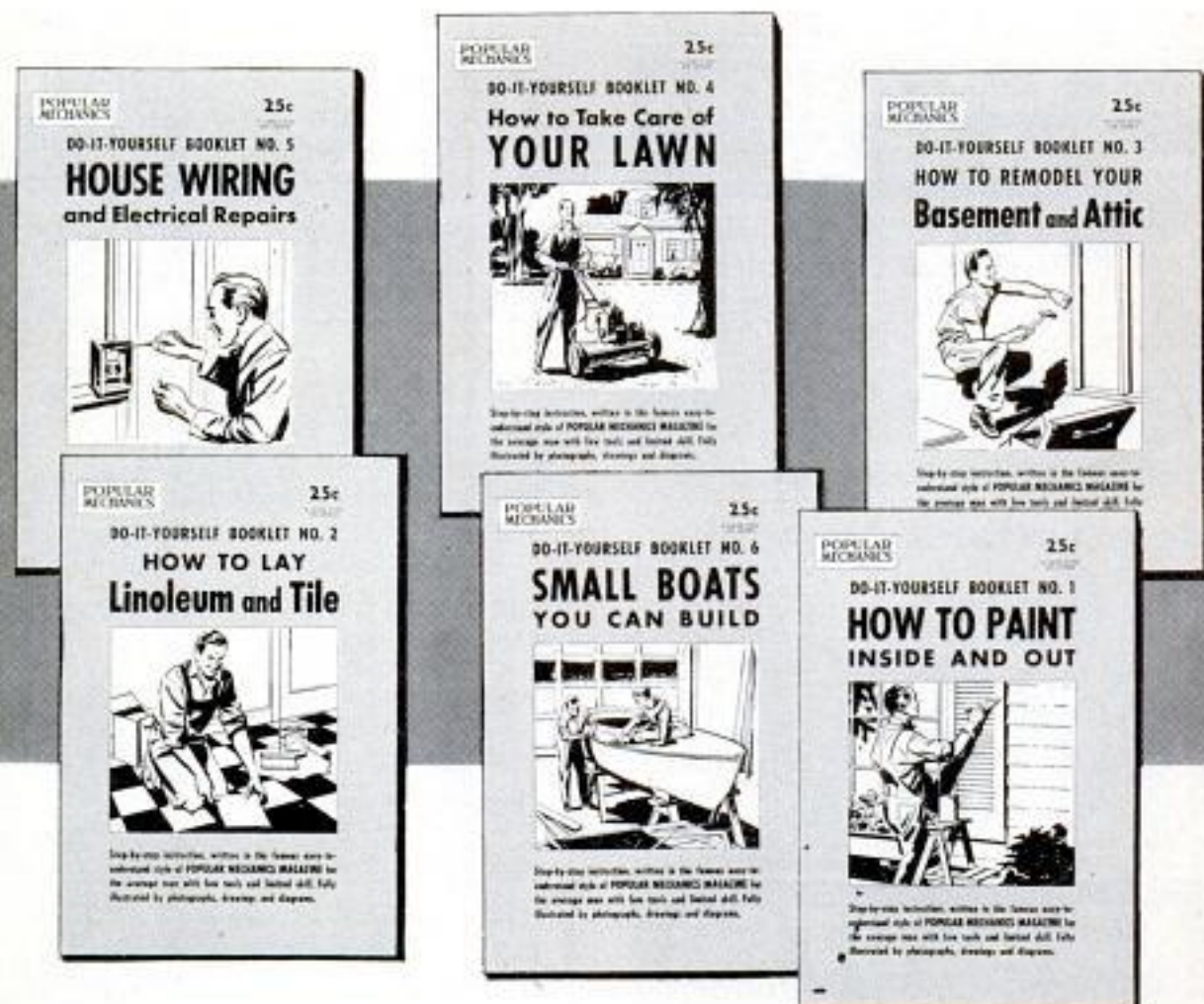
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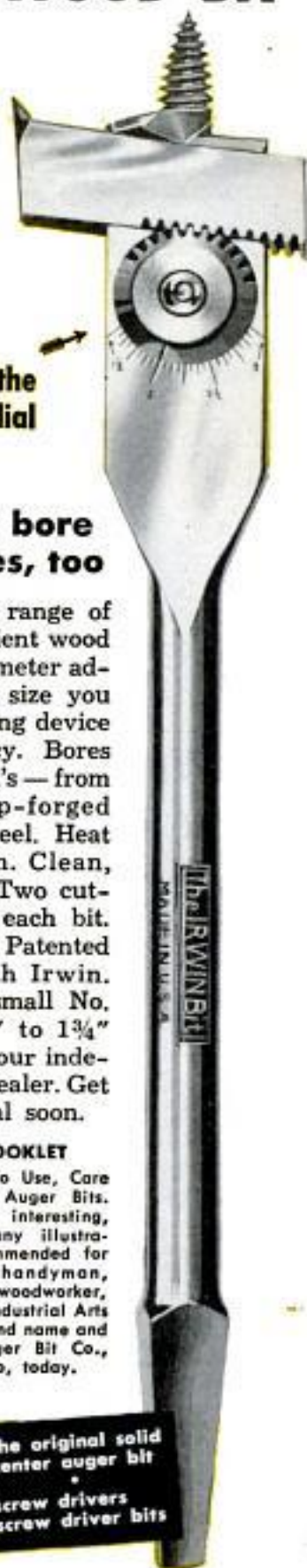
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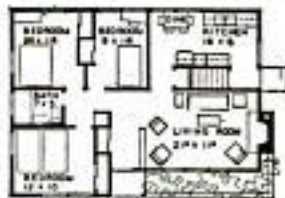
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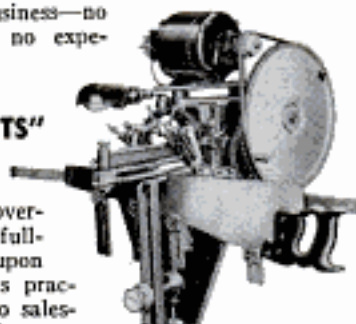
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Don't discard a drill bit just because the shank is worn and it slips around in the chuck of your power tool. Wrap a short strip of Emery Cloth by CARBORUNDUM around the shank, grain side in — insert in the chuck and tighten. Works fine!

Wood screws will hold better in plaster if you put 'em in this way: Drill your hole, slightly smaller than the diameter of the screw; then, before you drive the screw, insert a small roll of steel wool in the hole. The screw will force the steel wool to expand and "bite" into the plaster . . . and the screw will stay "put".

Steps that are slippery when wet needn't be! You can avoid possible injuries and lawsuits by gluing — with waterproof glue — sheets of RED-1-CUT® Waterproof Paper by CARBORUNDUM, grain side up, on each step. Same treatment works in your shop — on floors made slippery by oil and grease dripping from machines. (CARBORUNDUM sells a special product, called "SLIP-PROOF Fabric", to industry; it gives the same protection to operators of all types of equipment which must be oiled and greased). RED-1-CUT® Waterproof Paper should be on your shelf, anyway — for putting smooth finishes on lacquered or varnished surfaces. Get a supply of assorted grit sizes from your lumber or hardware dealer.

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"HOW TO SAND" is the name of a helpful little pamphlet by the CARBORUNDUM folks. You can have a copy — free — by writing me



"Handy" SANDY CARBORUNDUM

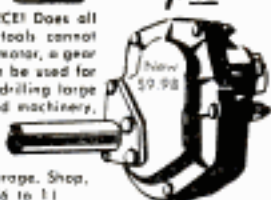
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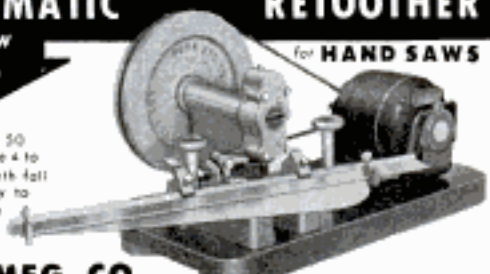
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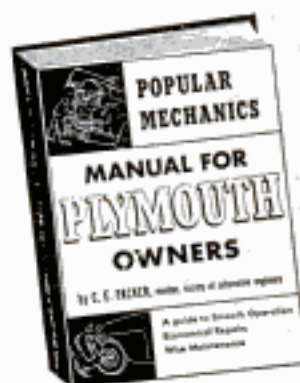
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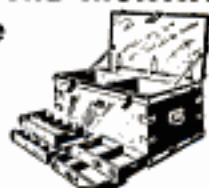
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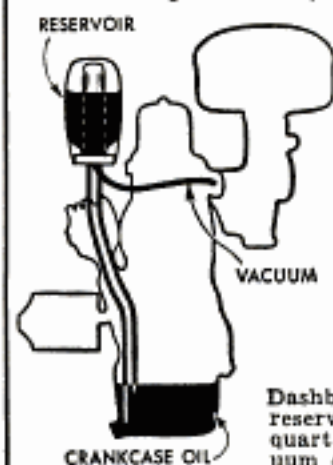
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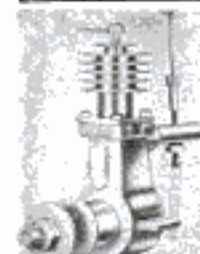
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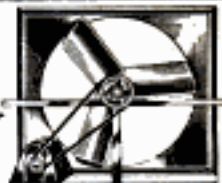
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THEREFORE, GRIZZLY has taken two important steps: (1) carefully selected its distributors, to make "Grizzly Authorized Brake Shoe Exchange" mean *honesty and reliability* that you can trust your life to, and (2) provided its authorized exchanges with Grizzly trade-marking equipment to brand the *outer* side of each lining with Grizzly's name *and* the grade of the lining, after the lining is bonded or riveted to the shoe.

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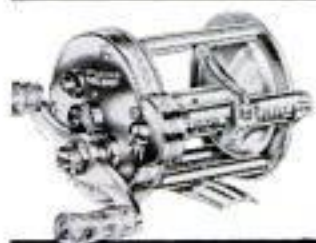
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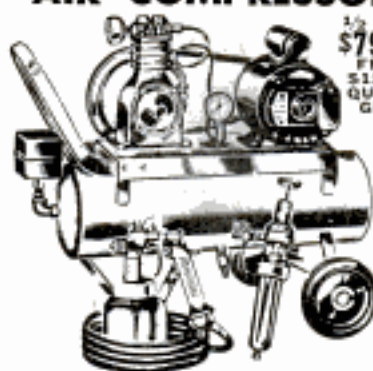
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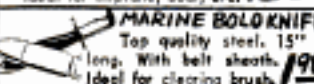
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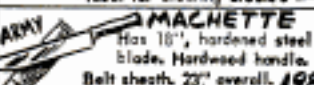
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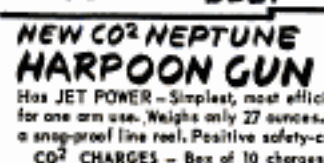
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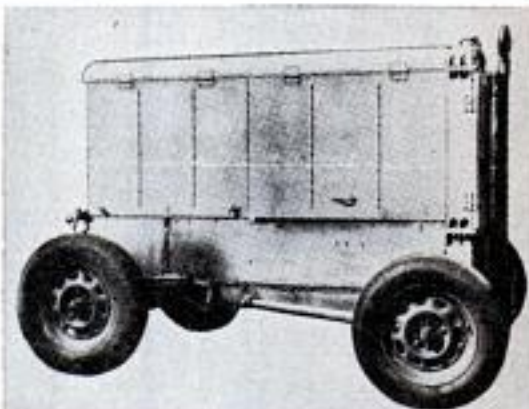
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P.O. Box 1516 • INDIANAPOLIS, INDIANA • Cable Address: INDMAC



**YOUR 1/4" DRILL POWERS
THIS NEW, IMPROVED
WOOD PLANER
ATTACHMENT**

NEW!
Aladdin
POWER PLANER

America's Finest

**SAVES TIME AND
WORK ON MANY JOBS**



and drill firmly together. Gives same "feel" as jack plane — many times faster. Change on or off in a jiffy.

Extra tough, heat-treated spiral rotary cutter, 2" wide with adjustable cutting depth from 0" to 1/4". Strong but lightweight die-cast alloy frame. Gears sealed in lubricant. Gears and cutter enclosed for safety. The perfect tool for handyman, amateur builder, home work shop.

SATISFACTION GUARANTEED OR MONEY BACK. See your dealer or order direct. Complete, ready to be clamped to your drill. **\$12⁹⁵**

On CODs, postage and fees extra. Literature **postpaid** gives complete description. **Order Today**

SANDING ATTACHMENT for planer & 2 Sanding Drums \$1.00 Extra.

ALADDIN MFG. CO. Dept. PM-1, 3125 HARRISON KANSAS CITY, MISSOURI

HOME AC VOLTAGE TESTER

Save needless service calls and wasted repairs.

An inexpensive, accurate voltage tester that will give you instantaneous readings right at the receptacle — no wires, no assembly. 90° swivel arrangement at the prongs makes reading easy from any position. Underwriter approved, \$4.50. If your dealer can not supply you send cash or money order to—

For Penna. Del.

Add 3c Sales Tax

ELECTRO MECHANICAL INSTRUMENT CO.

Perkasie 22, Penna.



You Can Build This Desk For Youngster or Adult

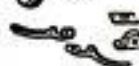
Now you don't need a basement full of power tools to have the pleasure of creating a useful and handsome piece of furniture. All the tools you need are a hammer, coping saw, handsaw and square. **MONEY BACK GUARANTEE.** For prompt delivery of detail drawings and instructions send 50c to

DON CROCKER

Rt. 5, Box 149, Port Orchard, Wash.



BUILD YOUR OWN POWER MOWER



With Parts We Furnish

Why break your back mowing field or lawn? Now anyone can save time, money and effort by building their own Power Mower. Build it to fit your needs, in a short time without special tools.

**PULLS
ITSELF,
STEERS
ITSELF**

WRITE FOR FREE BUILDING
INSTRUCTIONS—NO OBLIGATION

T & H Mfg. Co., 811 E. 31 St., Dept. M-6, Kansas City, Mo.

BUY DIRECT-FROM-FACTORY → at LESS THAN WHOLESALE

HI-LINE 6000 WATT PLANT
 Push Button Start 115-230 v. 60 cyc. A.C. A brute of a power plant with a rugged 14 hp. Wisconsin engine. Plenty of electric-ity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 390 lbs. Easily worth \$995. With self-starter. **Factory price \$645.00**
 Same plant, but with crank start, \$585.50
 Generator and control box only, best driven. Use your own engine or tractor. Wt. 240 lbs. (Item 163) **Factory price \$345.00**

Variable Speed Selector
 Heavy duty, made by B. F. GOODRICH for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Employs reliable "trouble free" planetary system. No hydraulic power losses. Infinite range, smooth operation, easy installation. 3 sizes! 1/2-1 hp, 36 lbs.; 1-2 hp, wt. 55 lbs.; 2-3 hp, Wt. 105 lbs.; Reg. list \$228, \$252 and \$352. Our prices \$79.50, \$89.50 and \$114.50

52 pc. SOCKET SET
 Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome thin wall alloy absolutely the best. Contains a complete set of 28 sockets in 1/2" drive, 3/8" drive and 1/4" drive plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. A beautiful set of tools that will handle any job in a big doghouse steel box. Wt. 17 lbs. (Item 205) Last price \$62.00. **Factory special \$27.95**

44 Pc. SOCKET SET
 (Item 206) Same unconditionally guaranteed, non-breakable sockets as above. Complete range of 21 sockets from 1/4" thru 7/16" (1/4" drive) & 7/16" thru 1-1/16" (3/8" drive). Two extensions, reversible 1/2" ratchet, 3 drift punches, sliding "T" head, all angle coupling, 1/4" speeder, 1/4" breaker, 5 pc. chrome alloy combination wrench set and 8 pc. offset wrench set in big doghouse tool box with angle room for other tools. Reg. \$49.50. Wt. 16 lb. **\$21.95**

MASTER AIR COMPRESSOR
 COMPARE! This is the only compressor built with a NO RUST stainless steel tank. Safe up to 500 lbs. (Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck & auto tires, greasing & the hundreds of other jobs done by compressed air. Piston type 2" cap. compressor with built-in air filter. Master built with high strength alloys and precision bearings. Tank, 12"x24", 2100 cu. in. cap. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Don't take chances with used or surplus equipment. Our compressors are factory new and are guaranteed SAFE. Low factory prices. With 1/2 HP, 110 v. AC motor. Reg. \$175. (Item 209p) **\$109.50**

AIR COMPRESSOR ACCESSORIES
 Pressure Gauge, range 0-160 lbs. 1/2" pipe thread connection, 2" face, **\$1.50**
 Check Valve, solid bronze, 200 lbs. pressure, works in all positions, 1/2" or 3/8" pipe threads, (specify) **\$3.35**
 Pressure Regulator, solid brass, std. 1/4" pipe thread, reduces any pressure to a range of 0-50. **\$3.75**
 Pop (safety) Valve, adjustable from 0-200 lbs. 1/4" pipe thread. **\$1.40**
SPECIAL... All four above... **\$8.95**
 Pressure Switch for pumps and compressors 0-85 lbs. **\$5.95**; 0-150 lbs. with unloader 0-85 lbs. **\$10.95**; 0-200 lbs. 1/2" 107, **\$12.95**

PORTO-POWER 1500-1700 WATT PLANT
 115/130 v. 60 cyc. AC. Push button start. Powered by a 3.10 HP Briggs engine. This plant combines the compactness and easy portability of the smaller plants, but has a high output to handle heavier starting loads. Built-in winding for charging 12 v. batteries. An ideal standby power plant for operating lights, sump pumps, oil burners and communication systems. Perfect for contractors and line crews. (Item 20.) Wt. 146 lbs. **Factory Special Price \$279.50**

MASTER-LIFE 2500 Watt Plant
 110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 HP Briggs engine, complete with all accessories. Includes control box, voltmeter, and handy plug-in power receptacle. An ideal plant for permanent or stand-by service. Wt. 225 lb. Reg. price \$645.00 **\$329.50**
3000-3500 WATT PLANT (Item 198) 110-220 v. 60 cyc. AC. Belt Drive. Wis. engine Push Button Start. Wt. 370 lbs. **\$399.50**
GENERATOR ONLY for belt drive \$239.50

PORTABLE LIGHT PLANTS
 (Ideal for your camp, cottage, trailer or boat!)

600-700 WATTS PUSH BUTTON START
 115 v. 60 cyc. AC. Powered by a rugged 2 HP easy starting Briggs engine. No wiring necessary! Just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense and Fire Dept. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24.) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Reg. \$275 value. **\$143.50**
1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine **\$199.50**
LITTLE GIANT—350 WATT (Item 273) 115 v. DC 1 1/2 hp. Briggs engine. Perfect for lights, radios, small power tools. **\$99.75**
 Wt. 65 lbs. Factory price. **\$99.75**
 We make fully automatic controls to operate any of the above light plants. Write for details. We make all sizes up to 25,000 Watts.

POWER MASTER DC ARC WELDERS
 Now! a portable, rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 2" plate using from 1/16" to 1/4" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. You can pay more, but you can't buy a better welder.

WELDER ONLY—DUAL CONTROL MODEL. Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item 38a.) Wt. 110 lbs. **\$119.50**
\$450 value.
WELDER ONLY—STANDARD MODEL. Same as above but with single rheostat for heavy metal welding only. (Item 38.) Wt. 110 lbs. \$400 value. Special... **\$99.75**
COMPLETE POWER MASTER (Illustrated above) powered by a 14 hp., air cooled Wisconsin engine. Wt. 480 lbs. (Item 280) Compares with welder costing **\$449.50**
WELDING KIT, Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder. **\$10.50**

GIANT 2000-2500 WATT PLANT
 110-120 v. 60 cyc. AC. absolutely the best made—exclusive dynamic balanced armature; heavy windings develop up to 3000 watt overload for motor starting. Skid mounted—portable. Powered by an easy starting Briggs or 6 HP Wisconsin engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 31) Wt. 210 lb. Reg. price \$585. Special at... **\$299.50**
 Same plant with electric self starter (Item 31a)... **\$359.50**
 Generator only and control box... **\$169.50**
DUAL VOLTAGE 110-220 available on any of above models for \$28.00 additional.

EXTENSION CORD
 (Item 18a) Heavy duty, made of Buna rubber insulated—14-2 conductor, stranded wire enclosed in a treated braided jacket. So tough that you can drive over it. Use indoors or out. Resists oil, grease or water. Extends electrically up to 400 ft. without voltage drop. Complete with heavy rubber plug and outlet. **\$1.99**
 (Item 18) 40 ft. 2 1/2 lbs. **\$1.99**
 Combination 2-40 ft. and 1-20 ft. total 100 ft. **\$4.95** (Item 16c) **\$4.95**
NEOPRENE CABLE—14-2 (Item 18b) Heavy duty, very flexible, 20 year quality. Wt. 9 lbs. 100 ft. Complete with rubber plug and outlet. A terrific buy at only... **\$8.95**
NO. 12-2 POWER CABLE. Very flexible rubber covered, special outside shield for grounding power tools, etc. 30 ft. (Item 199) wt. 8 lbs. **\$6.95**. 100 ft. (Item 200)... **\$12.95**

MASTER GARDENER SELF-PROPELLED
 It's a lawn mower It's a power sickle It's a cultivator It's a bulldozer
 Where else can you get a power tool that does so many jobs? Works for you year 'round. Does terrific job of cutting grass or weeds. Or prepares mellowed, deep seed beds without labor. Built-in power take-off to drive pumps, saws, etc. Safety clutch—can't burn out. New gear tread tires assure non-slip drive. The Master Gardener performs better—does more than tractors costing twice as much. Converts in minutes to Tiller. Power Sickle, etc. Basic tractor with Briggs and Stratton engine. Only **\$119.50**
 Rotary Lawn Mower... **\$42.50**
 Sickle Bar Mower... **\$42.50**
 Lawn Mower Hitch... **\$4.50**
 Furrowing Tool **\$6.75** Rotary Tiller **\$42.50**
 Cultivator... **\$8.75** Disc Harrow **\$18.75**
 Snow Blow **\$38.50** Plow... **\$15.00**
 Freight prepaid. Easy payment plan available.

HEATING & VENTILATING FAN
 (Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120V. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air, (400 to 600 CFM). **\$6.85**
 8" Fan, wt. 5 lb. **\$7.85**
 10" Fan, wt. 7 lb. **\$8.85**
 12" Fan, wt. 8 lb. **\$9.85**
HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E)... **\$11.95**
 12" Fan, wt. 10 lbs. (Item 10D)... **\$12.95**

CONDITION-AIRE EXHAUST FANS
 Save big money installing your own exhaust fan. Efficient propeller type blade moves huge volume of air quietly and effortlessly. Heavy welded frame—pre-drilled for easy installation. Just cut opening and bolt in place. Contains duty motors. Ideal for attics, restaurants, garages, barns, chicken houses, etc. Control manually or with thermostat.

Blade Opening CFM Wt. Item
 16" 181 1/2" 2925 19 lb. 365a **\$27.95**
 18" 191 1/2" 3600 27 lb. 365b **\$31.95**
 20" 21 1/2" 4100 30 lb. 365c **\$36.95**
SHUTTERS—open automatically, 16" wt. 10 lb. \$9.00; 18" Wt. 12 lb. **\$10.25**; 20" Wt. 14 lb. **\$11.25**

Send check or M.O. Prices f.o.b. Factory. 10 day Money back guarantee. SEND 10c for... **Big 1954 Catalog**

MASTER MECHANIC MFG. CO., DEPT. 10M Burlington, Wis.

Reading time: 3 minutes to learn how to

- cut engine wear up to 38%
- prevent loss of power, compression
- save 15%-25% on oil . . . without ever changing your oil filter

This Gadget is Worth \$320,000,000

...and I Discovered it by Accident!

by Albert Wells



IT ALL STARTED the day I got the bill: \$214.36 for an engine overhaul—and I had only 28,000 miles on the car!

I told my troubles to a neighbor—a lubrication engineer—told him how I'd always changed oil every 1500 miles, changed filters every 5,000 miles. His answer floored me.

"You've been wasting your money," he said. "We've spent millions developing oil additives that keep carbon, gum and abrasives from damaging your engine. Your oil costs about 15¢ more a quart because of those additives. Yet the throwaway absorbent filters you've been buying soak up these detergent additives like a blotter. When these additives are removed they can't keep your engine clean."

"But don't I need a filter to take the impurities out of the oil?" I asked.

He took a deep breath. "This will really shock you. Engine damage is done by abrasives 10 to 40 microns in size (a micron is .000039"). Absorbent type filters take out some of these abrasives but dirty oil leaks through when channels are formed in cloth and paper packs."

"Isn't there any kind of filter that does the job it's supposed to do?"

"No, except for the porous bronze filters they're making for supersonic aircraft. And you can't buy a filter like that for your car."

I asked myself: "Why not?" Next day, I tracked down the outfit that was making the filters for aircraft, and got the answer. These porous bronze filters were made by fusing together millions of tiny bronze balls. Non-absorbent, they didn't remove additives, yet they removed abrasives in the 10-to-40 micron danger zone. Could they be made for automobiles? Again, the answer floored me.

LIFETIME FILTER TESTED IN CARS, TRUCKS, BOATS

Test models had already been used in cars and trucks for millions of miles, proving the porous bronze filter: 1. Never needs replacing. 2. Saves the quart of oil thrown away with ordinary filter packs. 3. Increases engine life.

Trouble was, almost the entire production was being absorbed by military and industrial users.

That day I went to work on the biggest job of my life: setting up production of the Lifetime porous bronze permanent filters for cars and trucks (an estimated \$320,000,000 replacement industry).

HOW TO GET A LIFETIME FILTER FOR YOUR CAR

Try the Lifetime filter on your car for 2 weeks: if it isn't all I say, you get your money back; if you keep it, you're through buying filter packs—the Lifetime filter is guaranteed for 10 years, actually will last many times that long.

For complete unit, including case and fittings (install on any car in 10 minutes), send make, year and model of your car and \$12.95 (we pay shipping).

For conversion kit, which replaces your present filter pack with Lifetime bronze, send make and number of filter and \$6.95 (we pay shipping).

Or send only \$2 deposit, pay C.O.D. charges on arrival. But do it today—don't waste another cent on filter pack replacements!



Complete Lifetime Filter; fits any car.



Lifetime Conversion Kit; replaces ordinary packs with permanent bronze element.

Permanent Filter Division, Dept. FPM-6
CONTINENTAL MANUFACTURING CORP.
Washington Blvd. at Motor Ave., Culver City, Calif.

Ship complete unit conversion kit

Make, model, year of car or truck _____

Present filter make (if known) _____

I enclose

\$12.95 for complete unit (\$18.95—chrome)

\$6.95 for conversion kit

\$2.00 deposit; send C.O.D.

Name _____

Address _____

City _____ Zone _____ State _____

OPPORTUNITY FOR DEALERS AND DISTRIBUTORS

A dealer and distributor network is now being formed to handle demand generated by advertising and editorial features in national magazines. If you can qualify, you can be first with the most exciting automotive product of this decade, to win new customers and build a substantial business. These valued franchises are not being sold; they are awarded on the basis of ability to grow with us. For complete details, write or wire: Continental Manufacturing Corporation, Dept. FPM-6 Washington Blvd. & Motor Avenue, Culver City, Calif.

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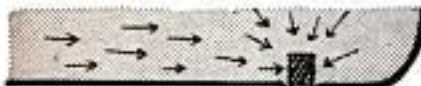


Here's How a Simple Device Increases Power, Pick-up, Speed and Performance up to 10% and assures Engine Life up to 300,000 Miles

A Chemical-Metallurgical Discovery, **MAGNA-POWER OIL DRAIN PLUG** Neutralizes Corrosive Acids As They Form In Your Crank-Case

IT'S LIKE A SACRIFICE HIT!

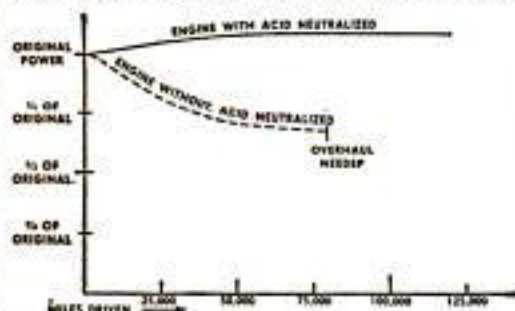
The magnesium-aluminum alloy is made a part of Magna-Power oil drain plug to stack up into the oil in the crankcase to attract and neutralize any corrosive acids there. It will serve this purpose 100% for many thousands of miles. Each time you change oil have the mechanic examine the alloy part of the plug for any signs of deterioration. Chances are there will be a film of corrosion darkening the surface (scratch it with a piece of metal—a key will do—to the bright under body) or completely covering it if large amounts of corrosive acids have been in your oil. Such signs mean that Magna-Power has taken out the acid action that would have otherwise attacked the vitals of your engine. You can thank Magna-Power for removing these harmful acids and for keeping the abrasive acid products off the working parts of your engine.



CORROSIVE ACIDS GO FIRST FOR THE MAGNESIUM—BECOME NEUTRALIZED—AND THUS BY-PASS PARTS THEY USUALLY ATTACK

The acids in your engine will eat away those metals that are most easily eaten or attacked. Since magnesium is by far the most easily eaten, acids attack it first and are neutralized or destroyed in the process.

NORMAL DECREASE IN ENGINE POWER COMPARED WITH POWER PROTECTED BY ACID NEUTRALIZER



IMPROVE IGNITION—WASTE LESS GAS

Explosion heat and part of the exhaust stroke keep spark plugs hot for only about a quarter of the time. The rest of the time the plugs are cool enough to be affected by the oil. We know this because the type of oil used has a great deal to do with the deposits on and around them. Acids in this oil eat electrodes, attack porcelain and cause short circuiting deposits that keep the spark plug from doing its job. With corrosive acids neutralized they maintain top efficiency for thousands of miles, which saves gasoline.

Thanks to the Oil Industry for its multimillion dollar scientific researches and processing improvements, almost any of the leading motor oils today will assure fairly safe protection against FRICTION . . . What most should concern the wise car owner today is PROTECTION AGAINST CORROSIVE ACIDS! That's now proved to be the Major Cause of Engine Wear!

STRONG SULPHURIC ACID—YOUR MOTOR'S WORST ENEMY. Today's motor oils have practically no residual acid. Some are even advertised as alkaline to begin with. But gasoline (or fuel oil) contains about one part per thousand of sulphur. One thousand gallons—enough to drive 15,000 to 20,000 miles—may therefore contain the equivalent of about 5 gallons of good strong sulphuric acid. Also present are substantial amounts of bromine (added to leaded gasolines) and chlorine (with the lead), both acid formers. Despite good engine ventilation these destructive acids, in gas or liquid form, find their way into the oil chamber or crank-case. After the first few thousand miles this cumulative corrosive action begins to take its toll—in loss of power, pick-up, speed and performance.

THE ANSWER TO INNER CORROSION—MAGNESIUM ALLOY ATTRACTS AND NEUTRALIZES THESE ACIDS. It is well known to chemical and metallurgical engineers that magnesium and aluminum in proper combination as an alloy will form a dragnet affinity for acids. To clear all corrosive acids from your crank-case oil, what could be more simple, then, than a special crank-case plug made of this magnesium alloy? **MAGNA-POWER Oil Drain Plug** screws in like your regular plug but the effective alloy metal extends up into the crank-case oil. There, like a potato that draws salt out of water, Magna-Power draws corrosive acids and neutralizes them as they form. (You can see this action for yourself. Drop a **MAGNA-POWER** into a glass of vinegar or even grapefruit juice and watch the wild effervescent foaming that results.)

YEARS OF ROAD TESTS OVER MILLIONS OF MILES PROVE THE MAGNA-POWER CAN KEEP ENGINES AS POWERFUL AS NEW. As INSURANCE against the need for overhaul for literally hundreds of thousands of miles, no accessory or use of specially made premium motor-oils can compare with **MAGNA-POWER** acid neutralizer drain plugs. Scores of big motor fleets, bus lines, trucking companies and passenger cars have tested them. The enthusiastic letters are available to you at any time.

INSTALL THIS AMAZING ACID NEUTRALIZER NEXT TIME YOU CHANGE OIL—FOR FINEST—LONGEST ENGINE PERFORMANCE. Magna-Power neutralizer is guaranteed to combat corrosion for at least 100,000 miles! Several types are available for all makes and models. It's simple to install—in a matter of seconds—at any time of oil change after your car's original break-in period of 2,000 or 3,000 miles. Stop rust—stop sludge—neutralize acid with this simple device—and "wear-proof" your engine for the life of your car!

ORDER A MAGNA-POWER NOW—ready for Next Oil Change and Remember Our Money-Back Guarantee is Good ANY TIME. Mail the Coupon below—Today!

**SATISFACTION
GUARANTEED OR
MONEY REFUNDED
AT ANY TIME**

**JOHNS
MANUFACTURING CO.**
Dept. A-6, Dunellen, N.J.

**MAGNA-
POWER
DRAIN
PLUG**



A METALLURGICAL DISCOVERY

The base of this remarkable plug is like standard plugs for wrench installation. But the extension above the base is made of a special magnesium-aluminum alloy which is known to neutralize corrosive acids.



Winthrop A. Johns, originator and manufacturer of Magna-Power crank-case plug, is a graduate of Massachusetts Institute of Technology and a member of the S.A.E. He is shown here with his original test car. "I don't expect to live long enough," he says, "to wear this engine to the first overhaul. At the present rate of wear it will run at least 700,000 miles."

A CHECK TEST. Magna-Power plugs have been subjected to road tests in various passenger cars for periods up to fourteen years. Full scale fleet and passenger car testing began four years ago when about 1,500 test vehicles were started. After 147,000 miles in fourteen years the original test engine shows practically no wear and has the same or more pick-up and power as when new. It uses 1 quart of No. 20 oil in 1,400 miles!

JOHNS MFG. CO., Dept. A-6, Dunellen, N. J.

My car is a _____ (make) _____ (year).
Please send me a **MAGNA-POWER** acid neutralizer.
I enclose \$2.95. I understand that it is sold with
an unconditional guarantee of satisfaction or my
money back!

Name _____

Street _____

City _____ State _____

ENGINE SLOW?



EARNING POWER LOW?



SHOVELING OUT DOUGH?



'TAINT YOUR FRIEND...BUT YOUR FOE!



Replace it with a...

REO

It's designed for the man who wants **POWER**
...plenty of power!

Reo's Gold Comet engine zips you up and over the hills up to 15% faster than similarly rated trucks carrying the same payload.

It's designed for the man who wants **Plus-Payload!**

Reo's exclusive more-payload design permits heavier loads and bigger ton-mile profits.

It's designed for the man who wants **comfort!**

Reo's improved cab is all comfort! Full 30 in. doors, comfortable steering wheel angle, unobstructed vision, foam rubber seats on tractor models...lots of other features, too!

Test drive the **REO**...it's designed for a man like you!



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